A. COVER PAGE FORMAT

1. Identifiers:

Project Number:	Not yet assigned
Project Name:	Conservation and Management of Pollinators for Sustainable Agriculture, through an Ecosystem Approach
Duration:	5 years
Implementing Agency:	United Nations Environment Programme (UNEP)
Executing Agencies:	Brazil: Brazilian Ministry of the Environment Ghana: University of Cape Coast India: G.B. Pant Institute of Himalayan Environment and Development Kenya: National Museums of Kenya Nepal: Ministry of Agriculture and Cooperatives, Gender Equity and Environment Division Pakistan: National Agricultural Research Centre South Africa: South African National Biodiversity Institute United Nations Food and Agriculture Organization (FAO) Rome, Italy
Requesting Countries:	Brazil, Ghana, India, Kenya, Nepal, Pakistan, South Africa
Eligibility:	The requesting countries have all ratified the Convention on Biological Diversity: Brazil on 28 February 1994; Ghana on 29 August 1994; India on 18 February 1994; Kenya on 26 July 1994; Nepal on 23 November 1993; Pakistan on 26 July 1994; and South Africa on 2 November 1995.
GEF Focal Area:	Biodiversity
GEF Programming Framework:	OP # 13 (Agrobiodiversity)

2. Summary

The development objective of the project is improved food security, nutrition and livelihoods through enhanced conservation and sustainable use of pollinators. The immediate objective is *to harness the benefits of pollination services provided by wild biodiversity for human livelihoods and sustainable agriculture, through an ecosystem approach in selected countries.* The outcomes of the project will be an expanded knowledge of pollination services, enhanced conservation and sustainable use of pollinators for sustainable agriculture, increased capacity to conserve and sustainably use pollinators, and enhanced awareness of conservation and sustainable use of pollinators for farmers, land managers and for policymakers. The project will show how the services of pollination can be conserved and used sustainably in agriculture through the application of the ecosystem approach. Project outcomes will be tested, evaluated and showcased in a set of representative farming systems in seven countries with a wide diversity of ecological zones and farming patterns. Through the development of good agricultural practices for pollination services, built on an extended knowledge base, capacity will be increased and awareness raised to promote wise management of pollinators and their services. The result will be a set of tools, methodologies, strategies and best management practices that can be applied to pollinator conservation efforts worldwide.

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3. Costs and Financing (US$):

GEF:

- Project		
	Brazil	$4,500,000.00
	Ghana	$373,458.00
	India	$304,000.00
	Kenya	$480,000.00
	Nepal	$193,258.00
	Pakistan	$339,000.00
	South Africa	$620,966.00
	Global level	$1,000,000.00
- PDF B		$700,000.00
	Subtotal GEF	$8,510,682.00

Co-financing

FAO:	(in-kind)	$841,075.00
	(cash, extrabudgetary)	$400,020.00
Other International:		
	(in-kind)	$349,097.00
	(cash)	$667,000.00
Governments (in kind):		
	Brazil	$6,620,318.00
	Ghana	$550,300.00
	India	$247,300.00
	Kenya	$30,000.00
	Nepal	$115,000.00
	Pakistan	$271,199.00
	South Africa	$361,853.00
Governments (cash):		
	Brazil	$7,590,434.00
	Ghana	$8,000.00
	India	$180,400.00
	Kenya	$70,000.00
	Nepal	$0.00
	Pakistan	$87,636.00
	South Africa	$257,689.00
Co-financing of PDF-B		
	- FAO	$377,000.00
	- Other Regional and International	$279,000.00
	-BPI	$289,000.00
Total Project Cost		**$28,103,003.00**

4. Associated Financing (Million US $):

N/A

5. Operational Focal Point Endorsement:

BRAZIL: COSTA, Carlos General Coordinator for Social Operations Ministry of Planning, Budget and Management Secretariat of International Affairs	Date of Endorsement: 6 March 2006 *Date of Re-endorsement:* 22 September 2006
GHANA: NSENKYIRE, Edward O. Chief Director Ministry of Environment and Science	Date of Endorsement: 25 January 2006 *Date of Re-endorsement:* 30 August 2006
INDIA: MITAL, Sudhir Joint Secretary Ministry of Environment and Forests	Date of Endorsement: 22 March 2006 *Date of Re-endorsement:* 19 September 2006
KENYA: Mwinzi, A.M. Acting Director General National Environment Management Authority	Date of Endorsement: 28 February 2006 *Date of Re-endorsement:* 4 September 2006
NEPAL: GHIMIRE, Madhav Prasad Joint Secretary Ministry of Finance	Date of Endorsement: 13 March 2006 *Date of Re-endorsement:* 13 September 2006
PAKISTAN: HAYAT, Khizar Joint Secretary, International Cooperation, Ministry of Environment	Date of Endorsement: 3 March 2006 *Date of Re-endorsement:* 14 September 2006
SOUTH AFRICA: YAKO, Pamela B. Director General Department of Environmental Affairs and Tourism	Date of Endorsement: 22 March 2006 *Date of Re-endorsement:* 20 September 2006

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LIST OF ACRONYMS/ABBREVIATIONS

AGROVOC	Agricultural Vocabulary database of the FAO
API	African Pollinator Initiative
ARC-PPRI	Agricultural Research Council-Plant Protection Research Institute
BPI	Brazilian Pollinators Initiative
CAPE	Cape Action Plan for People and the Environment
CBD	Convention on Biological Diversity
COP	Conference of the Parties
EA	Executing Agency
EMBRAPA	Brazilian Corporation for Agriculture Research
EPI	European Pollinator Initiative
FAO	Food and Agriculture Organization of the United Nations
GAP	Good Agricultural Practices
GBIF	Global Biodiversity Information Facility
GEF	Global Environment Facility
GPP	Global Pollination Project
HKH	Hindu Kush Himalayas
NAPPC	North American Pollinator Protection Campaign
IA	Implementing Agency
IABIN	Inter-American Biodiversity Information Network
ICIPE	International Centre for Insect Physiology and Ecology
IT	Information Technologies
IPI	International Pollinator Initiative (the CBD International Initiative for the Conservation and Sustainable Use of Pollinators)
IPPC	International Plant Protection Convention
ISC	International Steering Committee
MAPA	Ministry of Agriculture, Livestock and Food Supply, Brazil M&E Monitoring and evaluation
MMA	Ministry of the Environment, Brazil
MINFAL	Ministry of Food, Agriculture and Livestock, Pakistan
NAPPC	North American Pollinator Protection Campaign
NBSAP	National Biodiversity Strategy and Action Plan
NBSIP	Nepal Biodiversity Strategy Implementation Plan
NGO	Non-governmental organization
OP	Operational Programme
PDF	Project Development Facility
PIF	Integrated Fruit Production Program (Brazil)
PIMS	Pollinator Information Management System
PMU	Project Management Unit
PROBIO	Projeto de Conservação e de Utilizaçào Sustentável da Diversidade Brasileira (Project for the Conservation and Sustainbable Use of Brazilian Biological Diversity)
SANBI	South African National Biodiversity Institute
SARD	Sustainable Agriculture and Rural Development
SBSTTA	Subsidiary Body for Scientific, Technical and Technological Advice
STAP	Science and Technical Advisory Panel
STEP	Study, Training, Evaluation and Promotion Sites
TAG	Technical Advisory Group
UNEP	United Nations Environment Programme

UNEP/DGEF	United Nation Environment Programme, GEF Division
UNDP	United Nations Development Programme
USP	University of São Paulo

TABLE OF CONTENTS: PROJECT DESCRIPTION

LIST OF ANNEXES

B. PROJECT DESCRIPTION

BACKGROUND AND CONTEXT (BASELINE COURSE OF ACTION)

Global Significance of Pollination

1. Pollination is a keystone process in both human-managed and natural terrestrial ecosystems. It is critical for food production and human livelihoods, and directly links wild ecosystems with agricultural production systems. The vast majority of flowering plant species only produce seeds if animal pollinators move pollen from the anthers to the stigmas of their flowers. Without this service, many interconnected species and processes functioning within an ecosystem would collapse. With well over 200,000 flowering plant species dependent on pollination from over 100,000 other species, pollination is critical to the overall maintenance of biodiversity in many senses. Animal pollinators allow many kinds of flowering plants to coexist in an ecosystem, rather than limiting it to the dense, lower-diversity stands of wind-pollinated plants that dominated before the flowering plants evolved. Pollination services thus shape plant communities and determine fruit and seed availability, providing tremendously important food and habitat resources for other animals.

2. The diversity of pollinators and pollination systems is striking. Most of the 25,000 to 30,000 species of bees (Hymenoptera: Apidae) are effective pollinators, and together with moths, flies, wasps, beetles and butterflies, make up the majority of pollinating species. Vertebrate pollinators include bats, non-flying mammals (several species of monkey, rodents, lemur, tree squirrels, olingo and kinkajou) and birds (hummingbirds, sunbirds, honeycreepers and some parrot species). Current understanding of the pollination process shows that, while interesting specialized relationships exist between plants and their pollinators, healthy pollination services are best ensured by an abundance and diversity of pollinators.

3. Approximately 80 percent of all flowering plant species are specialized for pollination by animals, mostly insects. The dependence of ecosystems on animal pollinators is even stronger in the tropics than the global average: less than 3% of all tropical lowland plants rely on wind for pollination. In the tropical forests of Central America, insects may be responsible for 95 percent of the pollination of canopy trees, and vertebrates (bats and a diversity of other taxa) may pollinate 20 to 25 percent of the subcanopy and understory plants and insects a further 50 percent. Arid and mountain ecosystems often have highly diverse pollinator communities as well, with finely tuned adaptations to ensure that pollination is effective even when climatic conditions are erratic.

4. In agro-ecosystems, pollinators are essential for orchard, horticultural and forage production, as well as the production of seed for many root and fibre crops. About two-thirds of the crop plants that feed the world, plus many plant-derived medicines in our pharmacies, rely on pollination by insects or other animals to produce healthy fruits and seeds. Of the slightly more than 100 crop species that provide 90 percent of national per capita food supplies for 146 countries, 71 species are bee-pollinated (but relatively few by honeybees), and several others are pollinated by thrips, wasps, flies, beetles, moths and other insects. It has been estimated that at least 20 genera of animals other than

honeybees provide pollination services to the world's most important crops. For human nutrition the benefits of pollination include not just abundance of fruits, nuts and seeds, but also their variety and quality; the contribution of animal-pollinated foodstuffs to human nutritional diversity, vitamin sufficiency and food quality is substantial.

5. The degree to which human food production depends on animal pollination services lacks hard figures; however, as many fruits and vegetables require pollinators, it is certain that pollination services are critical to the production of a considerable portion of the food supply, as well as vitamins and minerals in the human diet. Estimates of the annual monetary value of pollination vary widely, from $120 billion per year for all pollination ecosystem services to $200 billion per year for the role of pollination in global agriculture alone. This range reflects the lack of common methods for assigning values to the role played by nature in general, and pollinators in particular. Recent research in coffee ecosystems in Costa Rica however, have shown that pollination services provided by wild bees living in adjacent forest patches contribute to 20% greater yields within one kilometer of the forest, and seven percent overall to the income of the coffee farms. In Brazil coffee plantations near forest fragments have shown a 14% increase in production, attributed to pollination services provided by the forest habitat.

6. Conservation of pollination services for sustainable agriculture is the focus of targeted campaigns in both North America and Europe, but the contribution of pollination to crop production in developing countries is largely undocumented. Knowing that pollination services are important to the horticultural crops that are of rapidly increasing importance in many developing countries' agricultural sector, and that wild pollinators may be eliminated in some agricultural development unless their needs are considered, a global pollination project with several partner countries has been designed, to extend the global capacity of pollinator conservation and sustained management.

7. Seven countries (Brazil, Ghana, India, Kenya, Nepal, Pakistan and South Africa) have worked together with FAO to identify activities that can address the threats to pollinators detailed below, and which will expand global understanding, capacity and awareness of the conservation and sustainable use of pollinators for agriculture. All the partner countries have some existing commitment to building capacity and enabling environments for conserving and managing wild pollinators; Brazil along with several African partners has taken a lead in establishing a global initiative on pollinator conservation. With coordination support from the Food and Agriculture Organization of the United Nations (FAO), this project aims to secure the benefits of information exchange, the dissemination of good practices, capacity building and enhancing knowledge at the farm, country, regional and global levels.

8. Across the range of the seven partner countries in the proposed project, management plans for agroecosystems dependent on pollination services in the humid tropics, subtropics, semi arid ecosystems and montane zones will be designed, implemented, evaluated and the results shared globally. The range of partner countries permits the project to include in its focus smallholder farms and large plantations; crops critical for food security and commodities important primarily in export markets; crops for which traditional knowledge contribute significantly to farmer practices, and crops that are grown according to the recommendations of agricultural research. Experiences from this

project will show how human use of ecosystems can both benefit communities while sustaining the ability of ecosystems to provide essential services, a central tenet of the ecosystem approach. From these specific focal and geographic areas, it will be possible to share the process as well as the substance of managing pollination services for human livelihood with farming communities and other land managers in other regions of the world.

Threats and Barriers

Limited Knowledge

9. Pollination as a factor in food production and security is little understood and appreciated, in part because it has been provided by nature at no explicit cost to human communities. As farm fields have become larger, and the use of agricultural chemicals that impact beneficial insects such as pollinators along with plant pests has increased, pollination services are showing declining trends. The domesticated honeybee, *Apis mellifera* (and its several Asian relatives) have been utilized to provide managed pollination systems, but for many crops, honeybees are either not effective or are suboptimal pollinators. Thus, the process of securing effective pollinators to "service" large agricultural fields is proving difficult to engineer, and there is a renewed interest in helping nature provide pollination services.

10. Pollination has not been perceived as an important agricultural input, and new research is just emerging on its contribution to agricultural productivity. For a number of crops for which pollinators were thought not to be important, new information is indicating that pollination services in fact can substantially increase yields. Yet there is no systematic or focused effort to incorporate pollination considerations in agronomy along with other important agricultural inputs, such as fertilizers, pest control and water management.

11. Effective pollination requires pollinating agents, which themselves require resources. For nesting, feeding and reproduction, they need particular vegetation and certain habitat conditions; thus, the application of "pollinator-friendly" land-use management practices can help to ensure their survival. There exists virtually no knowledge base about the specific needs of wild pollinators, particularly in developing countries; relevant and useful information is scattered in the taxonomic literature and specimen labels in museums, where brief mention may be made of floral associates or nesting habits.

12. A commissioned report to the Society for Conservation Biology suggests that declines in pollinator populations could have huge ecological and economic ramifications, from changes in wild plant communities and cascading effects to wildlife at all trophic levels, to declines in orchard, crop, seed and forage production. Yet the erroneous assumption remains prevalent, that pollination is a "free ecological service" that does not need to be conserved, nor managed sustainably. Very little information is currently being generated, in developing and developed countries alike, on good agricultural and land management practices to sustain natural pollination services.

13. At the same time as the role of pollinators is gaining increasing attention, mounting evidence points to a serious decline in populations of wild pollinators. Every continent (except for Antarctica) has reports of pollinator declines in at least one region/country. Numbers of honeybee colonies have plummeted in Europe and North America and most feral colonies have also been lost. The closely-related Himalayan cliff bee (*Apis laboriosa*) has experienced significant declines. In a regional study, all but one of the cliffs that were examined showed declines in the number of colonies or total loss across a 15 year period. The United Kingdom has lost more than half its species of bumblebees and similar reports of declining bumblebees and native solitary bees have come from Belgium and Germany. In Brazil, two species of native bees are officially listed as endangered: *Melipona rufiventris* is an endangered species in Minas Gerais and *M. quinquefasciata* in the north-eastern region.

14. Other pollinator taxa are also the focus of monitoring concerns: local and national-level butterfly (Lepidoptera) recording schemes in Europe show that many European butterflies are under serious threat because of changing land-use and agriculture intensification. Unfortunately, the concentration of data in northern Europe is more a reflection of the location of specialists than a reflection of zones of greatest concern. Other regions of the world that have high deforestation rates and apply high levels of agricultural chemicals, such as Brazil, are very likely to be experiencing similar declines of insect pollinators.

15. Strong evidence shows declines in mammalian and bird pollinators. Globally, at least 45 species of bats, 36 species of non-flying mammals, 26 species of hummingbirds, 7 species of sunbirds and 70 species of passerine birds are considered threatened or extinct. The ratio of threatened vertebrate pollinators to the total numbers of vertebrates in each genus is extremely high, which indicates that the world's nectar-feeding wildlife may be as vulnerable as carnivores to human-induced extinction pressure.

16. Assessment of the impacts of pollination disruptions on plant reproduction is profoundly disquieting, yet little explored. Under natural conditions, presumably unaffected by human disturbance, an estimated 62 percent of plants may be more limited by pollinator scarcity than by weather, soil fertility, herbivory or disease in determining successful reproduction. It could logically be expected that a smaller percentage of plants achieve adequate seed set under disrupted ecological conditions and human interference, yet a solid documentation or methodology for assessing pollen limitations has not yet been developed.

17. Changes in the distributions of most pollinator taxa and pollination failures remain poorly described. The challenge of identifying declines in pollinators is considerable given the high levels of rarity found in some taxa (e.g. bees), the lack of baseline data, and high spatial and temporal variation in pollinator populations. There has been no consistent assessment at the continental level, though assessments are currently being initiated in both North America and Europe. There is already, however, considerable direct evidence in the form of case studies recording declines of specific taxa in particular regions, and indirect evidence from studies focusing on the distribution of known drivers of pollinator loss as a surrogate for declines. This evidence, and the need for a global collaboration that pools case study evidence from a multitude of ecosystems and

contributes to a monitoring system that returns consistent, scientifically sound information to policy-makers, is set out in Annex J.

18. The patchy nature of the knowledge base for pollinator conservation, including plant pollination needs, identification of effective pollinators for pollination-dependent crops, trends in pollinator populations and an identification of wild pollinators' requirements to persist in agro-ecosystems, constitutes a barrier to effective conservation and management of pollination services.

Limited Use of Practical Pollinator-Friendly Management

19. One the most spectacular and well-documented instances of the need to manage wild pollination concerns oil palms. Oil palm trees native to West Africa were taken to Southeast Asia and planted in vast plantations to satisfy the global demand for cheap, versatile palm oil. But production was disappointing, until the plantation managers realized that it could be enhanced by hand pollinating the palm flowers. Yet hand pollination was laborious and inefficient. Researchers studied the oil palm in its native habitat of Cameroon, where they found a weevil that pollinates the flowers effectively while feeding on the pollen. The weevil now accomplishes all the pollination needs, bringing savings amounting to $150 million per year by the early 1980s. Yet this impressive success at studying and harnessing wild pollination services in a crop center of origin has not been repeated.

20. The agricultural development community has not been galvanized to act, even in light of these positive experiences. With managed honeybee populations declining steeply and more crops being grown under intensive systems, there is good reason to identify, in multiple agro-ecosystems and ecologies, the practices that will prevent the loss of pollination services provided by wild indigenous pollinators. Quite recent evidence confirms this suggestion. Conventional wisdom has held that crops such as tomatoes and coffee are self-pollinated, and growers need not concern themselves with insect visitors. But when crops are grown under increasingly industrialized conditions, such as in greenhouses for tomatoes, or high-input sun coffee, the contribution that animal pollination can make to yield--or conversely, the losses when native pollinators can no longer reach the crops--become more evident. Because restoration is far more difficult than conservation of existing interactions, a strong argument can be made in favour of conserving wild and indigenous pollination services in other systems before they are similarly lost. Management of wild pollination services requires an ecosystem approach with boundaries of the system drawn beyond fields, into the broader agroecosystem. Defining management concerns beyond the field limits is a relatively new concept amongst the agricultural community.

21. Due to declining pollinator populations and changing cultivation practices, an increasing number of farmers around the world are now paying for pollination services and are importing and raising non-native pollinators to ensure crop production. The problem, while most acute in developed countries, is also a concern in countries such as Brazil where passion fruit (*Passiflora* spp.) and soursop (*Annona muricata*) crops depend on hand pollination in some states.

22. In many developing countries, however, external pollination services are not available and rural communities have to live with reduced quantity, quality and diversity of foods. It is important to emphasize that pollination should be a concern of farmers from the standpoint of quality and diversity, not just quantity. In a time of decreasing commodity prices due to oversupply, yield gains may not always be the most important consideration for agricultural producers. Insufficient pollination may lead to fruit not developing, or to deformed fruit. With many fruit crops, such as watermelon, more pollination visits lead to larger and better quality fruit that is darker in color and richer in flavour. Insufficient pollination will result in mostly white pips. It has been suggested that the introduction of out-crossing pollen carried by long-distance flying bees may have a measurable quality impact on coffee. For pyrethrum, derived from the *Chrysanthemum* flower and an important commodity in Kenya, a more potent insecticide is produced when the flower heads have been visited by insects. In many countries, such as South Africa, quality is vitally important because good-quality, well-shaped fruit fetches much higher prices in the selective export market. If such quality considerations affect market share and market prices, pollination may contribute not solely to yields, but also substantially to the income per unit area for farmers conserving and sustainably using pollination services.

23. Many crops, through the selective breeding and replication practices of humans, lose their genetic diversity over time. Exposure to pollinators may be one means of introducing a selective influence to maintain genetic diversity. Studies on bottle-gourd in Kenya have shown how important a diverse pollinator community is to maintaining the extraordinarily diverse forms of gourds.

24. While good pollination practices are not a factor in the production of leafy vegetables and root crops, they do have a greatly underappreciated importance in the seed production of such commodities. Estimates of increased seed set due to pollinators have been made in different parts of the world; assured pollination has been variously responsible for increases in seed yield of 22-100 percent (radish), 100-300 percent (cabbage), 100-125 percent (turnip), 91-135 percent (carrot) and 350-9 000 percent (onion). The management of pollination in vegetable seed production, under rapidly changing seed markets and climatic regimes, has not received the attention it merits. Since seed production requires a certain degree of chilling to induce seed formation in temperate crops, many vegetable seed farms are located in mountainous regions, such as the Hindu-Kush Himalayas. While mountainous regions can provide such a climate, they also make farmers increasingly vulnerable to the effects of climate change. Farmers in the Kullu valley of Himachal Pradesh state in India are finding that overall temperatures have been rising, while rains have become more unpredictable, leading to several crop failures. Vegetable seed yields have been decreasing, yet the challenge of ensuring sufficient natural pollination under changing climatic conditions has not been addressed by researchers, much less farming communities.

25. The potential contribution to human livelihoods of identifying and implementing pollinator-friendly management practices for enhanced yields, quality, diversity and resilience of crops and cropping systems under development is substantial. Pollination has an important role to play in Good Agricultural Practices (GAP), an evolving concept addressing the concerns and commitments of a wide range of stakeholders about food production and security, food safety and quality and the environmental sustainability of

agriculture. The contribution of pollination, addressed through an ecosystem approach, ensure environmentally sound, high-quality food production and sustainable livelihoods for producers merits more emphasis.

Insufficient Capacity to Conserve and Manage Pollination Services

26. One of the major impediments to pollinator conservation is lack of capacity among different stakeholder groups to understand and implement the existing (not to mention future) knowledge base on pollination services. Capacity building for conservation and management of pollination services should cover a wide scope, from formal education at all levels, to the informal building of capacity among farmers, land managers, policy-makers and other critical target groups. A particular emphasis is needed on building capacity in taxonomy and pollinator identification, since this is one of the major impediments to pollinator conservation. Yet in a global review of capacity building in pollinator conservation and management, it was found that in formal education, pollination is often mentioned at a primary level, but receives relatively little mention at secondary or university levels. With the exception of some countries (e.g., Brazil and India), courses in pollination biology are rarely available. Even in those countries with courses that include pollination biology, pollinator conservation has not been integrated into courses on conservation biology, and pollination is not generally taught as part of agricultural sciences.

27. An even greater need in capacity building is to develop expertise and skills among farming communities and extensionists. The challenges to building capacity among farmers and land managers to conserve and manage pollination services are several:

- The actions that will need to be taken to conserve and manage pollinators are not completely known; to a large extent, capacity must be built in an adaptive way, as knowledge is being gathered.
- Conserving a natural service cannot be done by simple prescriptions; land managers will need to work with the challenges of their local ecology and develop management systems tailored to a specific site.
- Those people most knowledgeable about pollination of a particular crop or the biological requirements of a particular pollinator may be on another continent; therefore, long-distance sharing of information to build capacity needs to be developed.
- The taxonomic impediment creates a formidable barrier to practitioners knowing what their pollinators are and what scientific information exists about them.

28. The extent to which capacity building on pollination services enters into extension and farmer outreach is probably quite minimal at this point. A model of short courses on bee identification and pollination has been developed, first in North America, and more recently in Africa and Latin America, although the target audience of these more often has been scientists rather than field practitioners.

Insufficient Awareness

29. The flagship book and campaign that has brought considerable international attention to a potential pollination crisis is aptly titled *The Forgotten Pollinators*. Indeed, pollination seems to fall below the horizon of human awareness, in traditional as well as modern societies. Perhaps because insects are so inconspicuous as they industriously visit flowers, or perhaps because the system worked fine without much intervention in the past, the level of general public awareness, or even specialized awareness among farmers and agronomists, remains quite low.

30. Assessment of indigenous awareness of pollination in places as diverse as Bolivia, New Zealand, Ghana, Kenya and South Africa has shown that the range of understanding of pollination services is very wide within any particular society (see for example Annex F; Kenya and Ghana farmer surveys). Some farmers believed that bees were detrimental to flowers because they sucked energy from them, or cause flowers to fall after they visit Others had a complex and very accurate knowledge of what the bees do when they visit flowers and how important bees are for production in certain crops; knew that certain nut trees needed bees to visit the flowers for fruit to be produced; or that the most common bee visitor depended on an orchid species in the forest. Yet in all societies studied, despite some people's complex awareness of pollination requirements, farmers as a whole did not take measures explicitly to protect pollinator populations on and around their farms.

31. The current risks to pollinator diversity and crop pollination services have been identified primarily by scientists, and the level of awareness of pollination problems is probably highest in scientific communities. Even so, within the scientific community, discussion of pollination research is often relegated to a small section of an entomology or honeybee congress. Recently, the scientists have focused on the subtlety of the loss of pollination services; when the most effective pollinators are for some reason eliminated, plants will still be visited by pollinators, but less quantities of pollen may be deposited, or may be deposited at the wrong place on the plant or the visits may occur at times when the flower is less receptive to receiving pollen. Explaining this slow erosion of an ecological link to the general public is a challenge.

32. It is vitally important that understanding of pollination services is increased among the land managers and policy-makers in particular. The challenges to increasing public awareness of pollination services are several:

- Pollinators are largely insects, which are more often perceived as pests than as beneficial.
- The process of pollination is very subtle, and often has not been understood by farmers, much less the general public.

Limited Knowledge Dissemination

33. A major barrier to enhanced pollinator conservation and management is that the existing knowledge base is scattered and often inaccessible to people who need such information to intervene successfully on behalf of pollinators. From stocktaking studies carried out in the project development phase of this project, it is apparent that there is a

useful stock of knowledge to build upon in countries such as Brazil, India and South Africa, but much of this knowledge remains in documents that are either not widely accessible or unpublished such as the project reports and student theses.

34. The conventional formats for knowledge dissemination—such as dedicated university departments, journals and societies—either do not exist, or are much less developed for pollination information than for other, comparable knowledge areas, such as soil science, water and irrigation management or plant nutrition.

35. Pollination knowledge is distinctly ecological knowledge, and needs to be placed in an ecosystem context to be properly understood; it is neither solely about plant reproduction or insect visitation patterns, but rather about the interrelations. The interlinkages, while extremely important, make knowledge of pollination complex, and more like a network or information system than discrete bodies of knowledge. Early results indicate that the most critical interactions that determine reproductive success of plants are often not the most obvious ones, and actions taken to conserve plants do not necessarily conserve their pollinators. Therefore, an ecosystem approach is needed, and information dissemination on pollination services should reflect an ecosystem context.

Inadequate Policies

36. As important as pollination services are to food production and ecosystem regeneration, they generally operate below the horizon of awareness of policy-makers, and have rarely been addressed in explicit policies to conserve and more effectively manage pollination services. Brazil stands out as one country that has explicitly promulgated initial policies and intergovernmental directives to support pollination conservation and sustainable use.

37. The threats to pollinator conservation for sustainable agriculture are very much related to overall threats and barriers to sustaining both productive and environmentally friendly development in agriculture. Developing countries that try to meet the two predominant agricultural development objectives of food security and income generation from the export market find themselves in a dilemma. Highly productive agriculture is undoubtedly good for a country's social and economic stability, and greater agricultural productivity should, in theory, enhance food security and raise standards of living in farming communities. But there is growing evidence--backed by a substantial body of research--that modern agricultural techniques in both rich and poor countries are helping to undermine the natural resource base of the economies that depend upon it. This includes contributing significantly to the loss of biodiversity that might otherwise sustain agricultural productivity through such means as pollination.

38. Most solutions designed to make modern agriculture more biodiversity-friendly will need to be developed within a supportive policy framework. Many pollinator-friendly interventions are at the landscape level, beyond the scale of individual land holdings, and thus will require an effort of cooperation and coordination beyond individual holdings. For example, neighbouring farmers might be encouraged to protect adjacent areas of their farms, so that "corridors" that connect natural habitats are maintained. Or farmers might allow uncultivated areas to exist around and within cultivated ones. This would allow

grasses and other wild plants to grow, in order to control soil erosion and encourage pollinators and beneficial insects. Using such measures on land that is dedicated to connecting natural areas can go a long way towards conserving biodiversity, including pollinators. At the same time, protection of critical habitat for pollinators, in farming landscape, may provide benefits to landowners over an area much larger than the habitat that is protected.

39. Modern pest control strategies have often relied on the use of toxic chemicals, and pesticides have certainly helped to increase yields. But the indiscriminate and injudicious use of pesticides has led to well-known problems, such as development of resistance by certain pests, and some of the gains have been eroded as a result. Indeed, overall crop losses due to pests have risen globally, despite increased pesticide use. Non-toxic or less toxic active pesticides do exist. These include "bio-pesticides", whose active ingredients are living organisms such as bacteria, viruses, or plant extracts. But their adoption has been hampered by regulations; some registration procedures, for example, only recognise broad-spectrum chemicals. The policy environment could be modified to support pollinator conservation, as well as other environmental and sustainable agriculture objectives.

40. With few institutional or policy frameworks in place in most of the world to address pollinator decline, pollinator populations in agro-ecosystems can be expected to continue to decline precipitously as countries seek to increase agricultural productivity with systems of farming that are do not integrate pollination considerations. Countries that have progressed along these tracks of agricultural development (for example, Netherlands and the United States) are now having to consider how pollinator populations can be restored.

Baseline and System Boundaries

41. The existing knowledge base on pollination is centered in the developed and temperate world, whereas the knowledge relevant to pollinator conservation and sustainable use in the partner countries is fragmented and scattered and difficult to access. Much of the most valuable factual information, such as the floral associates of a particular pollinating species, are to be found on specimen labels in museums in Europe or North America. The inability to identify pollinators in the first place (the taxonomic or identification barrier) prevents field practitioners from developing effective interventions to conserve pollinators.

42. Recent reviews of the status of pollinator losses worldwide have concluded that the state of knowledge is most deficient in developing countries. Stocktaking studies carried out during the PDF-B phase have documented that the partner countries recognise the critical role of pollinators to sustainable agriculture, and have initiated activities to document and protect pollinators. Partners in Brazil have hosted three international meetings on pollinator conservation, and have formed a Brazilian Pollinator Initiative recognised by an interministerial government directive. Country partners have published two important volumes of papers on the status of pollinator conservation. The three partner countries in Africa have worked together to establish and lead an African Pollinator Initiative, with over sixty members in fifteen countries. They have produced a

plan of action and an initial stocktaking of pollinator conservation needs in Africa. Courses in bee identification have been initiated in Ghana and in Kenya. Partners in Nepal, Pakistan and India have looked into the contribution of pollination to rural livelihoods in each of their countries, as a valuable input into the development of the activities in this proposal.

43. All countries participating in this project have some research experience with pollination, although stocktaking studies on the knowledge base (as described in Annex F) has indicated that the scope has often been limited either to pollination in evolutionary biology, ecology and theoretical breeding systems research, or to managed pollination with honeybee colonies. Agricultural research programs and extension in all countries are focusing increasingly on horticultural crops, but only in Brazil have these programs highlighted the contribution of pollination to horticultural production and crop quality, specifically for strawberry, tomatoes and sweet pepper. There are no national research structures in place to compile, manage and make accessible information on pollination services beneficial to agriculture. Farmer knowledge of pollination tends to be highly variable even within a given farming community (Annex F).

44. Stakeholder groups include farmers and farming communities, extension agents, teachers and other multipliers, researchers, universities, NGOs and government ministries, but at present, it has been researchers who have been most involved in pollinator conservation initiatives. There is little linkage between the research and those who could apply the knowledge in the field. General public awareness of pollination remains low, yet managing pollination services appropriately will require the awareness of people beyond the farming communities, including land managers such as local government. Much of the publicity about pollinator decline has tended to describe the problem, but not to offer practical solutions.

45. The countries participating in this project comprise a range of agro-ecosystems, socio-economic conditions and ecologies, which capture a broad diversity of systems where interventions to conserve pollinators can be both challenging and effective (see Figure 1). The countries include a range of ecosystems, from subtropical and tropical zones to montane areas to semi-arid regions. Cutting across these ecological zones is an equivalent diversity of agricultural systems, from transitional shifting cultivation, to smallholder agriculture, to intensive systems of cultivation. The diversity of participating countries will permit learning across ranges of agricultural intensification and sharing of experiences across the broader agroecosystems; for example, montane systems of cultivating mustard seed occur in an extensive region from Asia to Europe, all of which can benefit from project findings. All countries participating have perceived declines in pollination services to crops of economic importance (Annex F).

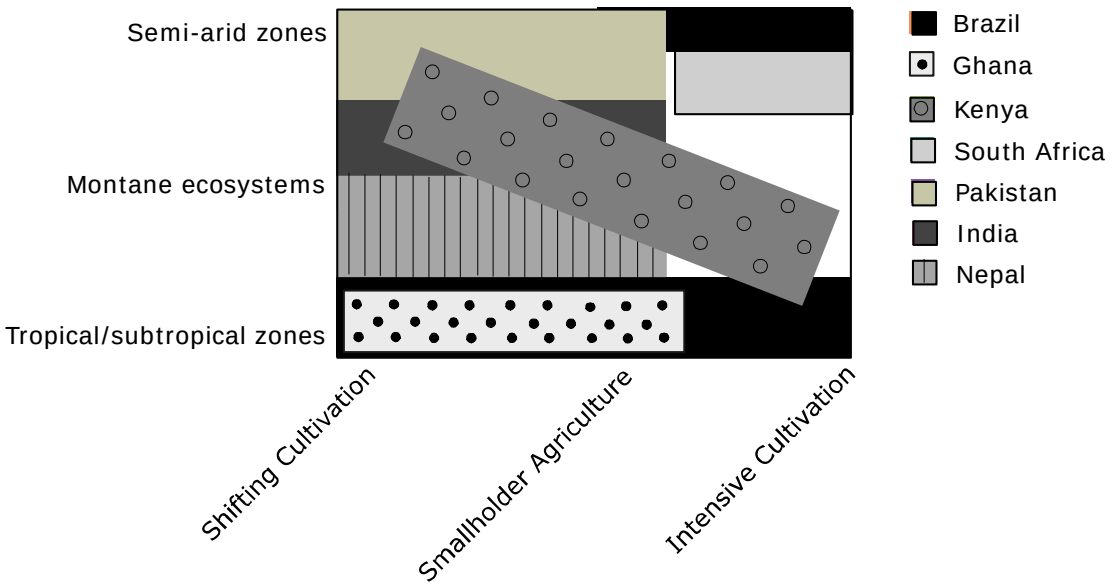

Figure 1. Range of ecological zones and farming systems in collaborating countries of the proposed project.

46. Each partner country in the project has developed strategies for ensuring the sustainability of outcomes after the life of the full-sized project. The Brazilian Government's Pluri Annual Plan already includes programs concerning pollination, sustainable use and nature conservation of biodiversity. The Brazilian Pollinators Initiative has been adopted by an interministerial directive, and is steered by a committee with representatives from four ministries and several diverse sectors. The participation of these different sectors of the society will ensure that pollination considerations are integral to decision-making in Brazil. Similarly, in Ghana, the project has been endorsed by the Ghanaian Government through the sectoral Ministries of Environment and Science with support from the Ministries of Food and Agriculture, and Local Government and Rural Development, ensuring the continuation beyond the main project period. It is expected that agricultural extension and research institutions involved as partners in the project in collaboration with the Ministry of Food and Agriculture will adopt the outcomes as part of their national budgetary activities for increased food production and security. In Kenya, the emphasis on using existing institutions and knowledge structures will ensure that the capacity built in state and private institutions will continue to benefit Kenyan farmers and the country in general. Training at universities, colleges and farmer training centers, including farmer field schools, will continue after the project is over through curriculum change initiated during the project. Existing institutional databases will incorporate pollinator and pollination information, which will continue to be manned and developed by the trained staff of these institutions. In South Africa, the South African National Biodiversity Institute (SANBI) has an existing environmental education programme which is geared up to incorporate any educational material that is developed during the pollination project and the pollinator public awareness campaign. The material will immediately supplement resources in the eight SANBI botanical gardens where the environmental education and community outreach programmes are situated. Furthermore, an ecosystem services unit is being developed at SANBI, and this unit will be in a position to make sure that the outcomes of the pollination project continue to be

mainstreamed into policy, as well as providing support for ongoing research on pollination. In Pakistan, an outcome of the project will be to have pollination accepted as a means of attaining the objectives specified by the Government of Pakistan's agricultural policy. The project will be taken over by the Pakistan Agricultural Research Council under the Ministry of Food, Agriculture and Livestock (MINFAL) for recurrent funding to run the project after the expiry of the full-size project. In India, it is envisaged that by the end of project, the components and work elements would be institutionalized within the mandated objectives of partner organizations, provided that the concept, components and work elements of the project fit in well within their area of operation. During the project, it is expected that the implementation of such pro-pollinator policies and guidelines by selected state governments within the project area will become a model for other states to follow in the aftermath of project. In Nepal, the project management unit will be based in the Ministry of Agriculture and Co-operatives, an important member of the national Biodiversity Coordination Committee and with strong linkages to multisectoral stakeholders from local to central levels in extending and continuing the pollinator conservation programs as developed over the project period. The Nepal Biodiversity Strategy Implementation Plan (NBSIP), in the process of finalization, has identified the "Conservation and Management of Pollinators for Sustainable Agriculture" as one of the prioritized activities of their biodiversity strategy, which will also serve to ensure the sustainability of the project.

Programming Context

International and Regional Policy and Action

47. The United Nations Convention on Biological Diversity (CBD) multi-year program of activities on the conservation and sustainable use of agricultural biodiversity was adopted at the Third Meeting of the Conference of Parties to the Convention on Biological Diversity in 1996. This programme of work recognizes that agricultural biodiversity is fundamental to issues of food security, and one of the important links is in the dependence of crops on a diverse variety of insect pollinators. The proposed project corresponds to the decision's definition of agricultural biodiversity as encompassing not only genetic resources, but biodiversity providing ecological services.

48. In recognition of a looming pollination crisis, there has been a mobilization of effort on several levels to address pollination management and conservation. On a global level, the international community has identified the importance of pollinators. Decision III/11 of the United Nations Convention on Biological Diversity (CBD) established the Programme of Work on Agricultural Biodiversity and called for priority attention to be given to components of biological diversity responsible for the maintenance of ecosystem services important for the sustainability of agriculture, including pollinators. In October 1998, the Workshop on the Conservation and Sustainable Use of Pollinators in Agriculture, with an Emphasis on Bees, was held in Saõ Paulo, Brazil. The outcome of this workshop was the São Paulo Declaration on Pollinators, which was submitted by the Government of Brazil to the CBD's fifth meeting of its Subsidiary Body for Scientific, Technical and Technological Advice (SBSTTA 5).

49. Considering the urgent need to address the issue of the worldwide decline in pollinator diversity, the Fifth Conference of the Parties to the Convention Biological Diversity established an International Initiative for the Conservation and Sustainable Use of Pollinators (also known as the International Pollinators Initiative-IPI) in 2000 (COP decision V/5, section II) and requested the development of a plan of action. The CBD Executive Secretary was requested to "invite the Food and Agriculture Organization of the United Nations to facilitate and co-ordinate the Initiative in close co-operation with other relevant organisations." In November 2000, FAO organized a meeting with the participation of key experts to discuss how to elaborate the International Pollinators Initiative. Subsequently, a Plan of Action was prepared by FAO and the CBD secretariat; the Plan of Action of the IPI, as adopted at COP 6 (decision VI/5), provides the contextual background for this project proposal. The present proposal has been designed to be consistent with the four structural elements of the IPI plan of action (assessment, adaptive management, capacity building and mainstreaming), and to serve as means of achieving the objectives of the plan of action, both globally and in the partner countries.

50. The aim of the International Initiative for the Conservation and Sustainable Use of Pollinators (IPI) is to promote coordinated action worldwide to:

- monitor pollinator decline, its causes and its impact on pollination services;
- address the lack of taxonomic information on pollinators;
- assess the economic value of pollination and the economic impact of the decline of pollination services; and
- promote the conservation, restoration and sustainable use of pollinator diversity in agriculture and related ecosystems.

51. In at least three regions of the world, regional pollinator initiatives have been formed and are building regional capacity in assessment and advocacy for pollinator management and conservation. The North American Pollinator Protection Campaign (NAPPC) brings together experts in academia, research, government agencies, agriculture, private industry, environmental groups and interested individuals from Mexico, Canada and the United States. The African Pollinator Initiative is an Africa-wide group of people committed to protecting, understanding and promoting the essential process of pollination for sustaining livelihoods and conserving biological diversity in Africa, which has been facilitated with support from the Food and Agriculture Organization of the United Nations (FAO). The European Pollinator Initiative was formed in response to growing evidence about local declines of pollinators in Europe, and a sense that the problem is more widespread.

52. Regional pollinator initiatives provide a baseline for the proposed project on pollinator conservation. The European Pollinator Initiative has been funded by the European Commission to carry out activities related to the assessment priorities of IPI in the European region. The North American Pollinator Protection campaign is addressing such questions as monitoring of pollinator trends and identification of pollinator-friendly practices in North America. The proposed project builds on these experiences. It will facilitate an equivalent set of focused activities on assessment, adaptive management, capacity building and mainstreaming to be developed and carried out in a diverse set of developing countries that are similarly committed to pollinator conservation. With developing country involvement, information exchanges and capacity building in

different regions, pollinator conservation and management can yield global benefits, making strong links between human livelihood and biodiversity conservation.

National Policy and Action

53. All seven partner countries have a clear commitment to reversing the losses of biodiversity in general and agricultural biodiversity and pollinators in particular, within their borders. In countries as diverse as Brazil, Ghana and Kenya, national pollinator initiatives have been established. Often these are led by national wild bee specialists, addressing scientific issues such as species systematics and distribution, community ecology of wild bees and plant-bee interactions.

54. In Brazil, a National Advisory Committee to the Brazilian Pollinator Initiative, under the coordination of the Ministry of the Environment, has been established by an interministerial government directive. Brazil has set pioneering examples for other countries in pollinator conservation measures. It has formulated an Understanding for Technical Cooperation between its Environment and Agriculture ministries regarding research on biodiversity and forests, including pollinator conservation and management, and has hosted three international workshops on pollinator conservation since 1998. Also in Brazil, The Integrated Fruit Production Program (PIF) of the Ministry of Agriculture, Livestock and Food Supply has carried out several experimental projects on good practices and management of sustainable fruit production, including pollination aspects.

55. Ghana's Comprehensive Development Framework – Natural Resources (1999) states that the major natural resource management problem and challenge in Ghana is land resource degradation and "*loss of biodiversity* resulting from *inappropriate farming practices* and unsustainable harvesting levels…". Ghana has designated a network of highly diverse Globally Significant Biodiversity Areas, from which extractive industries are excluded, and in which ecosystem services for local communities are to be enhanced. Pollination services for smallholder farmers could have a strong role to play in the management of these sites. In Ghana, representatives of the private sector have joined the national pollinator initiative.

56. India specifically refers to pollinators in their NBSAP, in more than one context. The critical role of "natural pollinators" is recognised when discussing "The genetic poverty of modern agriculture"; and while discussing "Loss of wild relatives, market orientation". Indian state governments are among the few that have recognized the role of pollination as a public good; for example, the Himachal Pradesh Department of Horticulture has established departmental bee-keeping stations, which are maintained solely for pollination purposes.

57. Kenya has included conservation of pollination services as part of its draft Biodiversity Regulations, following through on its commitment to the provisions of the Convention on Biological Diversity. As in Ghana, representatives of the private sector have joined the national pollinator initiatives.

58. Nepal has incorporated a pollination program in its Biodiversity Implementation Plan, ensuring that pollination will be mainstreamed into biodiversity conservation measures.

Nepal along with other countries in the Hindu-Kush Himalayan region have been involved in projects to protect indigenous honeybee species and address the particular needs of community management and benefit-sharing of the goods and services flowing from forests to agriculture in sustainable montane cropping systems.

59. In Pakistan's NBSAP, pollinators are specifically mentioned: "Biodiversity provides free of charge services worth hundreds of billions of rupees every year that are crucial to the well-being of Pakistan's society. These services include clean water, pure air, *pollination*, soil formation and protection, crop pest control, and the provision of foods, fuel, fibres and drugs".

60. Partner countries have also taken important steps toward articulating the need for a more sustainable agricultural development based on appropriate use of agrobiodiversity, while still seeking to raise productivity. The South African government is explicitly addressing pollination as an ecosystem service in its draft National Biodiversity Strategy and Action Plan. The Strategic Plan for South African Agriculture states that "Central to this strategy is to preserve *agricultural biodiversity* ...."

61. A preliminary analysis of the national policy frameworks, country priorities and existing activities in support of pollination services was carried out during the PDF-B phase, and is summarized in Annex E. The complementarity between approaches to pollinator conservation in the project countries will generate synergies and provide a solid "partnership" base for the project, where information exchange and the sharing of local, national and international experiences and lessons will play a significant role.

Global Environment Facility

62. The proposed project is consistent with the priorities of the Global Environment Facility (GEF) Operational Program (OP)#13, "Conservation and sustainable use of biological diversity important to agriculture." and supports the objective "to promote: the positive impacts and mitigate the negative impacts of agricultural systems and practices on biological diversity in agro-ecosystems and their interface with other ecosystems; the conservation and sustainable use of genetic resources of actual and potential value for food and agriculture...". The proposed project is consistent with the Strategic Objective 2 for GEF IV, and will significantly assist in achieving its aims to promote biodiversity in production landscapes, and to mainstream biodiversity into the agricultural sector. Specifically, an estimated 495,000 hectares of land in agricultural production landscapes will contribute to biodiversity conservation. In over 430 farming communities, incentive measures to conserve and sustainably use pollinators will be in place through improved livelihoods. Policy interventions that ensure that pollinator conservation considerations are included in spatial planning on local scales, to sustain such management systems, will be introduced within countries.

Linkages to IA and EA Programmes

63. One of the four main areas of intervention consistent with the United Nations Environment Programme's (UNEP) mandate in the GEF is "the identification and development of tools and methodologies for conservation and sustainable use of

biodiversity". UNEP has developed a specific focus on the needs of agrobiodiversity conservation, recognizing the importance of biological diversity to the functioning of sustainable agroecosystems. The implementing agency supports projects that enhance awareness, knowledge and understanding of crop-associated biological diversity providing ecosystem services to sustainable agricultural production by the expansion of the knowledge base, demonstration of methods for conservation, sustainable management, raising of public awareness and promotion of mainstreaming biodiversity conservation in sectoral policies.

64. The proposed project is consistent with the following areas of UNEP's mandate in the GEF, as identified in the UNEP Action Plan on Complementarity, approved by the May 1999 GEF council meeting:

- UNEP contributes to the ability of the GEF and of countries to make informed strategic and operational decisions on scientific and technical issues in programs and project design, implementation and evaluation, through scientific and technical analyses. These will include assessments, targeted research, methodology development and testing and structured programme learning projects.
- UNEP's projects promote regional and multi-country cooperation to achieve global environmental benefits, focusing on diagnostic analyses and cooperative mechanisms, and associated institutional strengthening.
- UNEP implements projects to promote specific technologies and demonstrate methodologies and policy tools that could be replicated on a larger scale by other partners.

65. The proposed project builds on FAO's lead international role in identifying actions to conserve agricultural biodiversity, recognising that many people's food and livelihood security depend on the sustained management of various biological resources that are important for food and agriculture. FAO has coordinated an international liaison group on agricultural biodiversity to promote the conservation and sustained use of agriculture-related aspects of biodiversity, including plant and livestock diversity, soil diversity, biodiversity that mitigates pests and diseases, and pollinators; as such, the proposed project will be able to engage other active contributors to collaborative work on conserving and using agricultural biodiversity, where appropriate. As an intergovernmental body, FAO facilitates the promotion of sustainable agricultural practices to its member constituencies (such as Ministries of Agriculture) in different fora through its Committees such as the Committee on Agriculture, Committee on Forestry and its Commission on Genetic Resources for Food and Agriculture. Information on policy developments relevant to pollinator conservation may be introduced in the policy discussion venues that FAO convenes.

66. Examples of related biodiversity and land management GEF projects in involving partner countries include the following; more details can be found in Annex H, Related International, Regional and National Initiatives.

67. The WB/GEF project "Building the Inter-American Biodiversity Information Network" (IABIN) (2004-2009) to improve the sharing of biodiversity information across national borders. IABIN was officially mandated by the Heads of State at the Summit of

the Americas in Bolivia, 1996. The project development objective is to: (i) develop an Internet-based, decentralized network to provide access to biodiversity information currently scattered in individual institutions and agencies in the Americas, and (ii) provide the tools necessary to draw knowledge from that wealth of resources, which in turn will support sound decision-making concerning the conservation and sustainable use of biodiversity. The project thus supports the implementation of Article 17 of the Convention on Biological Diversity (CBD) in promoting technical and scientific cooperation, and ensuring integration and exchange of information through the CBD Clearing-House Mechanism (CHM). The project involves the creation of a Pollinators Network, as one of five Thematic Networks (TNs) that will provide search and retrieval and analytical capabilities for data on a specific theme or area of interest. Brazil is an active participant in this project. Discussions have been underway on the means of information sharing between IABIN and the present proposed project; the pollination bibliographic database, plant-pollinator interaction databases and information management system to be developed by this project will provide useful global resources to the IABIN pollinators network, who form a clearly defined user group.

68. The UNDP/GEF PDF-B project Conserving Globally Significant Biodiversity in Cocoa Production Landscapes in West Africa (2004-2006) seeks to establish biodiversity- friendly cocoa production systems in Ghana through demonstration, scaling-up and market linkages. The project aims to build linkages up the supply chain so that cocoa purchasers are more aware of production practices, which will help influence them to pursue more sustainable practices through the linkage of environmental performance to market demand. It will also help develop national policy and regulations in Ghana to provide incentives to support agroforestry farming systems; in a demonstration area in south-western Ghana, the project will create pilot farm plots, train local extension services and cooperatives on how to support farmers across a landscape and how to plan and manage cocoa production systems across a large area. Many of the interventions proposed support effective pollination in cocoa. The Ghanian national coordinator has attended planning meetings for this project, and it is foreseen that the two projects may work together on specific recommendations for enhancing wild pollination services to cocoa, and capacity building of farmers in the management of sustainable tree crop systems.

69. The World Bank/GEF's National Biodiversity Project (PROBIO) in Brazil (1996-2005) has assisted the Brazilian Government in initiating a program for the conservation and sustainable use of biodiversity by facilitating partnerships between the public and private sector, disseminating biodiversity information and supporting partnerships between government, non-profit organizations, academic institutions and the private sector. In 2004, the PROBIO program issued a call for proposals on the development of pilot pollination management plans for priority Brazilian crops dependent on pollination, and supported 13 such pilot management plans for one or more native pollinators of plants of economic importance, as demonstrations of sustainable use and restoration of pollinator diversity. These projects, most of which will have been completed at the time the present project commences, form a body of knowledge and an initial starting point in the development of management plans for pollination services that can advance the progress of project outputs in Brazil (and in similar ecosystems) by considerable time, at least one year.

70. The World Bank/GEF Conservation Farming Project, led by the South African National Biodiversity Institute (SANBI), identified and evaluated the economic and ecological costs and benefits (in terms of biodiversity, carbon sequestration, and ecosystem health) of conservation farming practices, compared with more widespread land use and management practices, across 4 sites in South Africa on 27 farms with 18 different land uses. SANBI is also leading a number of regional biodiversity initiatives, the best developed of which is the CAPE Project (Cape Action Plan for People and the Environment), whose key aim is to mainstream biodiversity into all sectors of the community, including agriculture. The project has lent considerable experience to South African collaborators on the process of documenting ecosystem services; experience that will be shared amongst all project partners in the present project.

RATIONALE AND OBJECTIVES (ALTERNATIVE)

71. The project aims to show how the ecosystem service of pollination can be conserved and sustainably used in agriculture, through a set of targeted cropping systems in seven countries with a wide diversity of ecological zones and farming patterns. Through the development and testing of good agricultural practices for pollination services, built on an extended knowledge base, capacities will be built and awareness raised to promote wise management of animal pollinators. A set of tools, methodologies, strategies and best management practices will be created, which can then be applied to pollinator conservation efforts in relevant agroecosystems globally.

72. The development objective of the project is to achieve improved food security, nutrition and livelihoods through the enhanced conservation and sustainable use of pollinators. The project's immediate objective is *to harness the benefits of pollination services provided by wild biodiversity for human livelihoods and sustainable agriculture, through an ecosystem approach in selected countries.* The project aims to promote awareness that not just species, but also the interactions between species merit conservation and careful management, as a way to strengthen key ecosystem linkages. It seeks to underline the importance of linkages between conservation of ecosystem functions, sustainable production systems, and poverty reduction.

73. The anticipated project outcomes are:

Outcome 1. Integrated and accessible knowledge base for management of wild pollination services, for farmers, land managers and policy makers

Outcome 2. Enhanced conservation and sustainable use of pollinators for sustainable agriculture.

Outcome 3. Increased capacity for conservation and sustainable use of pollinators by farmers and land managers.

Outcome 4. Mainstreaming of pollinator conservation and sustainable use.

74. The proposed project will tackle the specific threats to pollinator conservation identified in the previous section on threats and barriers so that farming system design

and land management decisions affecting pollination services can be improved and better informed. Recognizing that the knowledge base is sparse and experts in the field are dispersed unevenly throughout the world, the project strategy is to consolidate the knowledge base and develop tools, capacity and awareness to apply this information to a set of diverse agro-ecosystems and farming systems. The knowledge infrastructure will be built up so as to mitigate pollinator declines and make pollinator conservation a strong component of sustainable agriculture. Studying and testing the application of pollinator conservation practices at a landscape level, in a diversity of farming systems and associated agro-ecosystems, will enhance practical knowledge; successful practices developed with local communities will then be showcased and promoted. These will include whole-landscape management and pollinator-friendly land management decisions. Gaps in capacity at several levels will be addressed, so that people will be trained to make use of new information generated by the project. The awareness of land managers and policy environments for pro-pollinator actions will be enhanced, by engaging critical stakeholders and forging stronger links between information managers, farmers and farming communities, on the one hand, and policy-makers on the other.

75. Project activities will focus on "Study, Training, Evaluation and Promotion" demonstration farm sites identified during the PDF-B phase. In-depth knowledge about pollination systems in a set of priority cropping systems and their wider agroecosystems will be developed and disseminated through the project information management system; these cropping systems may include apple, soursop, cotton, assai palm, melon, mango, passion fruit, tomato, coffee, cashew and citrus (Brazil); mango, citrus, chili pepper, tomato and coconut (Ghana); coffee, papaya, cucurbits, cashew, macadamia nuts and pigeon pea (Kenya); fruit trees, sunflowers, lucerne and onions (South Africa); persimmon, onion, almond, cucurbits, tomato, apple and pear (Pakistan); buckwheat, cucurbits, large cardamom, brassicas and colecrops, apple and pear (India); and mustard, buckwheat, cucurbits, mango, citrus and apple (Nepal). Criteria for selection of demonstration sites and priority cropping systems are found in Annex O.

76. Pollinator conservation will achieve multiple objectives of great importance to the aims of the Convention on Biological Diversity. It will help to guide agricultural development in sustainable, environmentally sound directions, while also reinforcing the value of wild lands for human livelihoods. It will demonstrate the mutually beneficial relationship between the conservation of biological diversity and the sustainable use of its components, as realised through an ecosystem approach. Together, these objectives will address current policy and institutional barriers to sustainable pollinator conservation and management and contribute to increasing agricultural production and supporting sustainable development.

77. Bearing in mind these objectives, and generally following the framework of the IPI Plan of Action, specific priority activities will be implemented at the international and national levels. The project will not only assist countries in achieving their obligations to the CBD, but will do this in collaboration, at an international level, where experiences in pollinator- friendly practices can be shared. It will allow for the exchange of methodologies, best practices and lessons learned at the national, regional and international levels. These efforts will also enhance the potential replication of management interventions. FAO's role, as a specialized UN agency, will include

facilitating the implementation of these activities and creating a forum for the sharing of knowledge. FAO will also ensure that pollinator-related activities already in progress will be capitalized upon.

78. During the PDF-B phase, proposed project components and their activities were explored and analyzed, effective strategies developed and relevant stakeholder groups identified. This work has guided the formation of the following four project components, corresponding to project outcomes:

- Integrated and accessible knowledge base;
- Extension and promotion of pollinator-friendly good agricultural practices;
- Capacity building; and
- Public awareness, mainstreaming and information-sharing;

Effective project management and implementation structures to achieve these outcomes have also been designed during the project development phase and are described as a separate component, Project Management.

79. The project will integrate existing scientific and traditional knowledge on diverse aspects of pollination services into a cohesive source of information. This strengthened and consolidated knowledge base will be made accessible to practitioners in the field, with obvious benefits for conservation and sustainable use of pollination services. The project will identify demonstrate and document the tools, methodologies, strategies and good agricultural practices that are needed for pollinator conservation and sustainable use, in selected agro-ecosystems in Brazil, Ghana, Kenya, India, Nepal, Pakistan and South Africa. These practices will be ones that can be effectively replicated in other parts of the world, throughout the broader agroecosystems that underpin the farming systems addressed in this project. The project will work to build local, national, regional and global capacities for the design and implementation of interventions to mitigate pollinator population declines, and establish sustainable pollinator management practices. In the partner countries, capacity among farmers, the agricultural research and extension community, and policy-makers to design and implement pollination management plans and policies will be built. Last, the project will ensure that the lessons learned are disseminated globally, that public awareness of the role and value of pollination services is enhanced and that measures to conserve and sustainably use pollinators are supported by the policy environment.

80. Achievement of the project objectives will be based on the following impact indicators:

- At least 495,000 hectares of land under target cropping systems in the area surrounding STEP sites is managed with good agricultural practices for pollinator conservation and sustainable use by project end.

- At least 20% of target farmers in 430 local communities in the area surrounding STEP sites improve crop production by 10% and crop quality through better conservation and management of pollination services by project end.

- Number of users of the expanded knowledge base on pollination will increase by 20% annually from its initial development to project end.

- At least 20% of farmers in the areas surrounding STEP sites will implement good agricultural practices to conserve and sustainably use pollination services by project end.

- Public awareness of pollination services increased by 15% in target groups around STEP sites through public awareness campaigns by project end.

- Policy recommendations that support and strengthen conservation and sustainable management of pollination services are developed, submitted to policy makers and incorporated in national strategy documents in at least two countries.

The complete list of indicators per outcomes and outputs can be found in the logframe in Annex B.

81. Global benefits of the project will be both to conserve pollinator species and their associated biodiversity in agroecosystems, but also their important ecosystem function contributing to agricultural yields and quality. The project will promote the availability and dissemination of information on good agricultural practices for conservation and use of pollination services, and to build capacities at the international level, as well as local and national, to enable the design, planning and implementation of interventions to mitigate pollinator population declines, and establish sustainable pollinator management practices. The project will promote the co-ordination and integration of activities related to the conservation and sustainable use of pollinators at the international level to enhance global synergies. All told, these objectives are expected to address current policy and institutional barriers to sustainable pollinator management, and contribute to increasing agricultural production and supporting sustainable livelihoods.

PROJECT ACTIVITIES/COMPONENTS AND EXPECTED RESULTS

Integrated and Accessible Knowledge Base

Outcome 1. Integrated and accessible knowledge base for management of wild pollination services, for farmers, land managers and policy makers

Development of a pollination bibliography and thesaurus

82. The challenges to pollination practitioners to access needed information is documented in Annex I. The specific activities needed to expand the knowledge base includes identifying and compiling the relevant bibliography including the generally inaccessible student theses, case studies and grey literature containing relevant and localized information on pollination services. Partners in each country will maintain and update a relevant bibliographic database, and updates will be exchanged on a regular basis so that a global database can be shared with partners and other practitioners. A global bibliographic database will be assembled and maintained, ensuring that the most relevant and fundamental sources are accessible through a bibliographic information

management system. More details can be found in Annex I, Pollination Bibliographic Database for the Global Pollination Project.

83. The careful construction of a pollination thesaurus, developed in consultation with international experts in the field, will provide a means of extracting the meaningful and pertinent literature sources from the bibliographic database for practitioners in the field, specific to cropping systems and ecological regions. The multilingual pollination thesaurus will serve as a substantial contribution to AGROVOC, a multilingual controlled and structured vocabulary database coordinated and maintained by the United Nations Food and Agriculture Organization.

Monitoring of pollinator trends

84. As a major contribution to the global understanding of pollinator conservation and management, this project will enable project partners in Latin America, Africa and Asia to collaborate and contribute information on trends of indicator pollinators to the global understanding of pollinator status. A considerable proportion of the data currently available on the status and trends of pollinators comes from developed countries; two large-scale monitoring programs are currently being instituted for the European and North American regions. This project will help further the development of more comprehensive and balanced understanding of pollinator trends. A summary of two pilot monitoring programs carried out in the PDF phase and which will inform the development of this activity is found in Annex J. Further refinement of monitoring methods will continue in collaboration with other regional initiatives in the full-sized project, using the Study, Training, Evaluation and Promotion (STEP) demonstration sites as locations for repeated monitoring.

Detection of plant pollination deficits

85. Because comparatively less attention has been given to pollination as a factor in crop yield over the last 100 years of agricultural research, the understanding of plant pollination needs and deficits is a newly developing field. The contribution of pollination to yield is rapidly being revised for many crops, including some such as coffee for which current management systems have completely discounted the contribution of visiting insects to crop yields. This project will make a timely contribution to the field of agronomy by convening an expert discussion and workshop on this topic, as well as organizing technical and lay publications on the issue. Tools for assessing pollen limitation, both in rapid assessments and in longer-term investigations and breeding programs, will be identified and tested in the demonstration sites of Component Two- Extension and Promotion of Pollinator-friendly Good Agricultural Practices- of this proposal in partner countries, and lessons learned will be widely shared. Further details are found in Annex K, Review of Issues Related to Plant Pollination Limitation and Agroecosystem Management for Pollination.

Promotion of agroecosystem management of pollination services

86. Practitioners and land managers need concrete information to understand how management of agro-ecosystems impacts on pollinator availability, and how an ecosystem approach can harness an environmental service for both human communities and healthy ecosystem functioning. Using a subset of the demonstration sites to be developed under Component Two, the project will consolidate the understanding of

pollinator effectiveness and provisioning in agro-ecosystems, through in-depth studies of the ecological characteristics of pollination services and measures to manage those services on a landscape level. It will seek to provide new understanding about such vital issues as which management practices promote the permeability of agricultural landscapes to pollinators; the persistence of diverse and effective pollinators in agroecosystems; and which human interventions are the most effective in preserving and managing natural pollination services. Recognizing that the practices that benefit pollinators may also benefit other sectors of biodiversity and ecosystem functions (for example, reductions in the use of pesticides and inclusion of wild habitats in agricultural landscapes may also promote the health of the biodiversity below-ground and the nutrient cycles and other services they provide), the research agendas will address interlinkages with other components of crop-related biodiversity. In the fourth year of the project, a workshop will be convened to invite researchers investigating these questions in project sites, as well as others in the field, to discuss the findings and broader issues to produce a publication regarding methods to identify and sustain pollinator effectiveness and availability in agricultural landscapes. (See also Annex K, Review of Issues Related to Plant Pollination Limitation and Agroecosystem Management for Pollination).

Assessing the values of pollination services

87. One of the greatest challenges to pollinator conservation is to develop an accurate means of assessing the economic value of pollination and the economic impact of the decline of pollination services, and to convey this knowledge to farmers and policy-makers. In the project development phase of this project, a study has been commissioned to recommend appropriate economic evaluation methods for the multi-faceted and multi-level question of pollination valuation (Details are provided in Annex L). Since many interventions for pollinator conservation have value for other ecosystem services (habitat management for pest control, watershed management), it will be important to develop valuation methods that reflect the complementarity of different ecosystem services. The project will develop standardized approaches for measuring economic valuation that also respect country and agro-ecosystem specificities. These methods will be applied to the agro-ecosystems selected for demonstration sites in Component Two. Dissemination of economic valuation results will be an important focus of the public awareness strategy (Component Four), with specific target audiences: farmers, land managers and policy-makers. The results will contribute to ongoing initiatives to value ecosystem services. In the third or fourth year of this project, a symposium will be held to assess, among other things, the possibility of extrapolating from one crop to another, one pollinator to another, or one region to another, based on the valuation information acquired during the project. Based on the conclusions of this colloquium, decisions on the most accurate and effective means to incorporate information on valuation of pollination services into the Pollination Information Management system will be made and implemented. Such specific technical information will be made available through the project website and other related websites of FAO, the CBD and UNEP.

Development of taxonomic tools

88. One of the largest bottlenecks to knowledge-based pollinator conservation and management is taxonomic. Amongst all national partners on this project, as well as other pollinator protection initiatives around the world, the need for an efficient system of facilitating pollinator identifications is a top priority. Virtually all of the knowledge base

for pollination conservation and management hinges on practitioners being able to identify, at least to genus, the effective pollinating agents. As the project gets underway, the common pollinating visitors to the target cropping systems of Component Two will need to be identified by experts. To ensure an efficient system, a network of taxonomic experts willing to assist with the routine identifications needed in the early part of this project will be identified. In some countries, the capacity of experts is strong, and what is most needed is a network that helps them to work collaboratively, each focusing on their areas of expertise. In some other countries where local taxonomic capacity is lacking, personnel need to be trained to sort species to morphospecies and thus to be able to identify what experts are needed for the identification of which specimens.

89. Once common pollinators have been identified through the identification networks, laminated pictures of common animal visitors to priority crops in each country will be provided to national partners. This will permit initial field identifications within an acceptable margin of error in the early stages of the project while other tools are under development. Even in the later stages, as user-friendly tools are developed, rugged field identification sheets will be created to ensure that the information is readily usable in field situations.

90. New interactive identification tools hold the potential to overcome large challenges in identification that could otherwise impede progress in pollinator conservation and management. This project will make an important contribution, on the global as well as regional and national levels, to developing a set of interactive electronic identification keys for bee (Apoidea) families, subfamilies and genera in the three regions of Latin America, Africa and Asia. An electronic catalogue of bee species, to be developed collaboratively with the Global Biodiversity Information Facility, will permit simplified access to the characteristics of bee species that forms the basis for interactive keys. By the second year, keys to bee genera in the project regions will be developed.

Development of a plant pollinator interaction databases

91. Promoting pollination services will require that decision-making be based on a better understanding of the biology and ecology of pollinators. Much of the pertinent information is concerned with ecological relations: the alternative floral resources, or nesting material for a pollinator whose populations need to be strong to provide pollination services during a short crop-flowering season. Important stores of data that can provide such useful information on pollination dynamics already exist, but they are presently fragmented and inaccessible. In taxonomy, for instance, there is considerable information on geographical distribution, floral associates and nesting requirements of pollinator species. In ecological databases, there are records of pollinator visitation to wild plant species and to crops that are not captured in specimen data or in the taxonomic literature- yet such databases are rare in developing countries. Information on pollination responses to weather conditions and climate change is becoming increasingly important in the agronomic field, and generally are absent in databases, although some information is available in the literature. There is a modest but highly relevant set of observations on differential toxicity to pollinators of agricultural chemicals. A community of data users and data providers have worked together to define the fields of information needed for effective pollinator conservation and management (see Table 2, Annex M). Critical datasets, for which some information currently exists, include knowledge of pollination

requirements for primarily pollinator-dependent crops in Latin American and the Caribbean, Africa and Asia; production statistics and distribution of pollinator-dependent crops; known effective pollinators of some of these crops; alternative forage resources, nesting needs, distribution, dispersal abilities and tolerance of climatic conditions of effective pollinators; and gene flow dynamics between crops and crop-related species. Information on key pollinators behaviour and population dynamics needed for their restoration or reproductive requirements for conservation in agricultural landscapes will be included. By serving as an information provider and collator of critical databases for pollinator conservation and management in collaboration with the Global Biodiversity Information Facility, the Global Pollinator Project can ensure that existing knowledge is captured in shared databases, that these databases are organized for maximum utility, and that new knowledge builds on and extends the existing base. More details on pollinator interaction databases, and the collaborations underway to develop them, can be found in Annex M.

Development of a pollination information management system

92. The information and databases to be built through the activities above must be presented in user-friendly formats that permit specialists and non-specialists alike to apply the information to practical situations. The expanded knowledge base to be developed will be integrated into a Pollination Information Management system, providing a globally accessible source of information for pollination practitioners. The Pollination Information Management System will integrate the tools and databases built through the activities above, and will include: bibliographic tools; identification tools; horticultural crop pollination requirements; relational databases linking pollinator species to crops, geographic distributions, alternative floral resources, nesting requirement, dispersal abilities, responses to meteorological conditions and susceptibility to agricultural chemicals; and recommended protocols for monitoring and economic valuation. The Pollination Information Management System will be area, crop and pollinator-specific, and initially will contain a limited amount of information, which will be validated and expanded over the life of the project. It will be designed to answer a set of critical questions for the conservation and management of pollination services, and will return responses only after they have been carefully validated for reliability. The information management mechanism will strengthen countries' capacity to manage biodiversity information for human livelihoods. Its continued maintenance after project end will be supported by national institutions and by FAO in its role as an information provider for sustainable agriculture systems. The parameters of the system and a more complete description of its proposed design are outlined in Annex N, Using Information Technology (IT) to Support Conservation and Sustainable Management of Pollinators: A Global Study.

Extension and Promotion of Pollinator-friendly Good Agricultural Practices

Outcome 2. Enhanced conservation and sustainable use of pollinators for sustainable agriculture.

Development and implementation of demonstration sites

93. In the project development phase, partner groups in the participating countries identified priority cropping systems with a high dependence on pollinators, and which also have important links to human livelihood and sustainable development. Criteria for Study, Training, Evaluation and Promotion (STEP) sites have been carefully developed in consultation with national partners and the international steering committee (Annex O). A provisional selection of cropping systems has been made that captures the diversity of systems and degrees of threat to pollinator loss in developing countries (Annex G). In at least one site per country, the suite of good pollinator practices that can be applied to each agro-ecosystem to conserve and adaptively manage pollination services will be identified, implemented and documented. Each site will comprise a cropping system and its wider agro-ecosystem, including adjacent natural ecosystems (details on these are found in Annex O). The participation of farmers and farmer communities will be central to the development of demonstration sites. Communities have been contacted and their willingness to participate and test new practices in pollinator-dependent agroecosystems has been determined. In most cases, sites will be located on farmers' land, and good pollination practices will be identified and applied in a participatory manner that responds to and respects farmers' livelihood needs. A diversity of farming systems will be addressed, from smallholder farms and shifting cultivation, to intensive levels of agriculture. STEP sites will provide an opportunity to test and explore the results of specific recommendations for conservation and management of pollination services in the context of a farming landscape. The target audience for the work to be carried out in STEP sites will be the farms and farming communities in the broader agroecosystem surrounding demonstration sites, that can learn and contribute to the identification of good agricultural practices for pollinator conservation and sustainable use, recognising through an ecosystem approach that system boundaries are beyond agricultural fields. The criteria for selection of STEP sites and a description of the objectives and design criteria of the sites, as developed through a consultative process with partners and experts in the PDF-B phase, is found in Annex O. In each partner country, national coordinators have identified at least one priority STEP site, and have collected baseline data characterising the site (with the exception of Brazil, where due to the scope of the full-sized project envisioned, the identification of STEP sites will be made by competitive bids). Details on preliminary work in STEP sites are given in Annexes O and T. As each STEP site will entail cooperative agreements with landowners and the willing collaboration of local communities- in addition to the identification of a diversity of sites across all countries meeting the defined critera- it is envisioned to proceed in a stepwise fashion in identifying further STEP sites within the full sized project.

94. The proposed interventions to be introduced into STEP sites to support pollination services will be based on the observations and experiences that have been collected, sometimes anecdotally in a diversity of agroecosystems, that wild pollinators visiting crops can increase the effectiveness of pollination, and thus the yields and quality of crop production; and that appropriate agroecosystem management can affect the diversity and

abundance of wild pollinators visiting crops. An indicative list of actions that can be taken to secure the benefits of wild pollination services include providing habitat on-farm for pollinators, respecting their resource needs such as ground or woody nesting sites, and reducing the use of agricultural chemicals. But proposed measures to conserve pollinators do not stand alone; they must be effectively integrated into existing farming systems and developed in an adaptive manner. Land managers will need to work with the challenges of their local ecology and develop management systems tailored to a specific site and farmers' competing uses of natural resources for sustainable livelihoods. The implications, feasibility and benefits of the practices for farmers and land managers also need consideration. The project will be able to develop, test and evaluate a framework for assessing the impact of practices on pollination services, and a set of protocols for best practices in managing agroecosystems for pollination services. By following a common and carefully developed methodology that will be thoroughly documented, the experiences of project partners will serve as a model for other groups wishing to develop such protocols. So that information is comparable, the same underlying questions will be asked in the diverse STEP sites and common methodologies will be used to answer these questions. The relevant hypotheses to be tested in demonstration sites are that:

- Crop pollinator populations and the ecosystem elements that support them are influenced by:
  - Proximity to natural ecosystems
  - Use of pesticides
  - Agronomic management practices
  - Beekeeping practices

- Improved practices benefit farmers (and ecosystems) through:
  - Increased productivity and/or improved quality
  - Resilience to environmental change
  - Sustainability of farming systems
  - Improved management of risk

The focus will be an ecosystem approach, and the management actions that promote the ability of agroecosystems to provide services.

95. From the analysis of baseline information collected in each site and the survey of good agricultural practices described below, site-specific interventions for each demonstration site will be identified. Using a "farmer field school" approach, the potentials and challenges of these interventions will be discussed among farmer groups, and a set of management plans will be agreed upon for demonstration sites and other landowners and farmers wishing to participate. Interventions will be carried out over a period of three years. Brazil, by benefit of its previous investment in the PROBIO program, has recommended interventions or site-specific management plans already developed for 13 sites in Brazil; thus, in this country, the numbers and staging of interventions may differ from the other participating countries. In some other countries, it is forseen to begin with a pilot phase of a STEP site, to assure that the results will match the efforts. Thus, a phased implementation of STEP sites is foreseen, depending on country capacity and previous experience.

Survey of best practices

96. As demonstration sites of pollinator-friendly good agricultural practices are developed, it is essential to base the activities on existing local practices, such as the protection of sacred groves in agricultural landscapes. It is also essential to survey all other land management and traditional knowledge practices that can be applied to pollinator conservation and use, in consultation with farmers, land managers and researchers, and to select meaningful indicators of good pollination practices in the evaluation of different interventions. A major focus within this project, and its particular contribution to global understanding of pollinator-friendly management practices, is on the maintenance of traditional practices that conserve agrobiodiversity, in particular pollinator diversity, in farming systems, before such practices are lost under intensification. Experience in similar projects (for example, the GEF-supported project, Conservation of Globally Significant Biodiversity in Agricultural Landscapes through Conservation Framing") has shown that careful inventories of existing practices will identify a core of good practices that can be built upon and improved to achieve conservation objectives, but initial assumptions of what are "beneficial" and "deleterious" practices are often incorrect. In the project development phase, existing practices in partner countries were documented on a macro level. Throughout the proposed project, an ongoing survey will be made of agricultural practices identified on the location-specific STEP sites and their impacts on pollination services, and the research or traditional systems supporting these practices, their socio-economic aspects, environmental costs, benefits and replicability. Contributions on good pollination practices will also be solicited from the global community, through a yearly call for case studies of good agricultural practices for pollinator conservation and sustainable use. A means of systematically assessing practices for their impacts on pollinators will be developed (utilizing the indicators as described below) and applied to case studies that are assembled, both from project partners and other contributors. This assessment will be shared globally through the project web portal.

Development of indicators of best practices and evaluation tools

97. Indicators of best management practices will be developed in consultation with specialists and partners in the first year of this project, using existing conceptual frameworks for restoring and monitoring ecosystem services at the landscape scale. The results obtained in the demonstration sites will be carefully evaluated in several dimensions: economic and productive, but also from biological, cultural and social perspectives. An analysis of the practices, indicator values and outcomes compiled through the survey and case study contributions will be undertaken to identify sound indicators for evaluation in the third year of the project. Like the development of the sites themselves, the modes of evaluation will be participatory. It will be important to recognize the many different bases of decision-making and criteria of success in evaluating best management practices. Evaluation of global benefits may need international expertise, whereas local benefits are best evaluated by local standards and locally developed indicators--though the development of evaluation procedures and tools will be useful on a global level.

Dissemination of lessons learned

98. The intergovernmental initiative on Sustainable Agriculture and Rural Development to realize Chapter 14 of Agenda 21 has recognized that local-level good agricultural practices (GAPs) need greater elucidation in location-specific contexts. Local level GAPs defined by concerned stakeholders may draw inspiration both from existing texts, such as the International Plant Protection Convention (IPPC), and from the broader GAP principles that promote the voluntary use of agricultural practices for achieving environmental, economic and social sustainability in different local settings. The good pollinator practices that emerge from the demonstration sites will be an important contribution to understanding how biodiversity and ecosystem services can be promoted locally. Dissemination of findings will be through the project website, other associated websites and through the public awareness strategy.

99. Pollination services are provided on the scale of one or two kilometres, which generally means that multiple landowners must cooperate to maintain or restore habitat or improve other practices friendly to pollinators. While there is potential for external benefits and external costs to be distributed inequitably, it is also the case that farming communities form interactive social units that often recognize their interdependence. The experience of working with communities to help them develop management plans that extend to landscapes and on-farm habitat will be carefully documented, so that management plans can be shared with a wider audience. In other cases, such as in Brazil and South Africa, the range of scale of landholdings may include farms that encompass all of the critical pollinator habitat, and this again presents new possibilities and challenges for management. A manual on the development of pollinator management plans will be developed and disseminated through the project website, as well as by other media.

Translating lessons learned into general guidance to farm communities

100. To ensure the replicability of the project outcomes, the lessons learned from STEP sites will be translated into more general guidance for local farming communities. By distributing the findings and evaluation of STEP sites to a network of experts working on other pollination systems, we will seek their assistance in identifying those conclusions that have broad applicability to other farming systems. Through a set of commissioned papers and peer review, a technical publication will be produced, and will inform another publication directed to a broader audience (to be produced as part of Component Four).

Capacity Building

Outcome 3. Increased capacity for conservation and sustainable use of pollinators by farmers and land managers.

Elaborate training needs

101. Training modalities and curriculum for pollinator conservation and management are virtually nonexistent; pollination has not been adequately recognized in formal and informal education at all levels. As noted previously, the actions required to conserve and manage pollinators are not completely known; hence capacity must be built in an adaptive way, even as knowledge is being gathered. Therefore, a continuous means of identifying and assessing needs in capacity building will be built into project activities,

both in terms of capacity to extend the knowledge base, and capacity to design, implement and promote pollinator-friendly practices. Both the effectiveness of the modes of training and the increase in knowledge will be assessed, and will then be used for improving the curricular materials and training courses. National coordinators will regularly evaluate the capacity-building program, and the International Steering Committee meetings will serve as a venue for discussion and to orient capacity-building activities to address identified needs. The full description of the planned project capacity building strategy is provided in Annex P.

Training of trainers

102. Three levels of national training courses will be provided over the course of this project. The first will target the multiplier level-agricultural extension institutions and agents, non-governmental organizations involved in technical agricultural services and teachers and university students who can include specialized knowledge in their teaching or research. Training in both methods and technical approaches to the different dimensions of pollinator conservation and management (monitoring of trends, identification of pollinators or development of local keys to pollinators, economic valuation of pollination services, assessment of plant pollination deficits and pollinator effectiveness and availability, pollinator habitat conservation, pollinator-friendly pest management) will be developed and offered to build national level expertise in these areas. They will also be trained to access the Pollinator Information Management System and extract relevant information for farming communities on particular crops.

Training of farmers

103. Second, courses will be developed for farmers and land managers, employing participatory training techniques and facilitating community-based research and testing in and around Study, Training, Evaluation and Promotion (STEP) sites. The observations and experimentation of farmers, extension officers and land managers with pollinator conservation and management and adoption of various techniques will form a community learning tool for farmers and others working with pollinator-dependent cropping systems. In some countries such as South Africa where the avenues of appropriate technology transfer from research to farming communities is well developed, the emphasis in training will be on research and research extension rather than on farmer training and training of trainers.

Short courses and presentation for other key groups

104. Third, shorter seminars to raise the awareness and understanding of specific target audiences--such as journalists, policy-makers, and staff of key institutions such as state agricultural and environmental agencies, producer associations, conservation organizations, teachers and students--will be offered, particularly in connection with demonstration site visits.

Review, adapt and develop training material for target clients

105. Existing capacity-building materials on conservation and management of pollination services are few, but nonetheless can serve as a basis for the development of an integrated set of training components. Development and refinement of new training material will require a collaborative global process, bringing together knowledge of different aspects of pollination services scattered throughout the world. Training materials will also need

to be specific to target audiences such as teachers, students, farmers, extensionists, NGOs and policy-makers. Training materials will be adapted to local needs in project countries, and will be made available to those in other countries wishing to adapt training material for local needs.

Provide training at formal school level

106. Opportunities for capacity building at the formal school level will require introducing coverage of pollination into syllabi and teaching materials. On a global level, informed by national experiences and case studies, appropriate curricular material will be developed and promoted among textbook development divisions in the responsible government agencies of the participating countries, as well as among textbook publishers.

Training of parataxonomists

107. In each region (Latin America, Africa and Asia) parataxonomists will be trained to make use of the user-friendly identification tools developed in activity 1.6. Expertise will be built to sort pollinators into morpho-species and carry out full identifications using the reference collection for the crop that will be developed in the first year or the user friendly identification tools.

Develop distance training

108. At project initiation, an overall course structure for distance learning in conservation and management of wild pollination services will be established. The overall structure and design of an e-learning course will serve as an organising principle for the development of all curricular materials throughout the project. The Technical Advisory Group will, in its initial meeting, identify the scope, structure and relevant modules. Course modules appropriate for the initial training of trainers, developed with instructional designers, will be made available to the capacity building activities in all countries, and will be adapted as needed in each country. Course content will be enhanced based on project experiences in demonstration sites and other activities, to create a comprehensive distance learning course for both extension and university courses. Profiles of experiences in developing best practices in one country will be available to use as case studies for training in all other countries. This distance learning courses, including informational material, case studies, exercises and exams, will be developed and tested in pilot programs in at least two countries. The effectiveness of a distance learning program will be assessed in year four, and by the end of the project, arrangements will be in place for a sustainable host for the programme to take over its full management, making it available globally. Possible hosts for distance learning have been identified in the project development phase.

Development of roster of experts

109. Because those who are most knowledgeable about pollination of a particular crop or the needs of a particular pollinator may be on another continent from the agro-ecosystem where the pollination service is taking place, long-distance sharing of information to build capacity needs to be developed. The kinds of expertise needed in the management and conservation of pollination services and experts in the relevant areas will be identified. A roster of experts whom practitioners can consult will be developed. Using FAO's experience with developing contact lists of experts, means of connecting expertise with needs, while respecting the need for privacy, will be elaborated. A network

interface for contact points will be developed for the project's web portal and linked to the Pollination Information Management System (PIMS).

Public Awareness, Mainstreaming and Information-sharing

Outcome 4. Mainstreaming of pollinator conservation and sustainable use.

Assessing levels of awareness
110. In all partner countries, the majority of people--and especially the rural people most affected--have little understanding or awareness of the pollination process, nor of actions that are detrimental to it. The public at large is mostly unaware of the benefits to food production from pollination, crediting instead other factors such as the use of fertilizers or particular management practices. Focusing on the target audience that is best positioned to benefit from and practice pollinator conservation- farmers and land managers- a thorough survey of the level of awareness of pollination at the inception and completion of the project will be undertaken in a subset of project countries. The survey will both establish baselines where these do not exist, and help to determine how messages to raise awareness can most effectively be framed.

Raising public awareness for pollinator conservation and sustainable use
111. Substantially increasing the level of awareness in the target audiences of farmers, land managers and policy makers of the role of pollinators is critical for attaining the project's objectives. A strategy has been built directed to relevant target audiences, including those groups prioritised by partners within each country, and also priority audiences on the international level. A range of public awareness vehicles to reach the different target audiences has been identified, recognizing the diversity of groups to be addressed and the variety of geographical, cultural, and economic environments in which they live. More details can be found in Annex Q.

112. STEP sites will serve as living laboratories of the process of working with biodiversity to support human livelihoods. Being able to open these sites to a wider public, including adjacent communities, schoolchildren, and policy-makers will expose a broader audience to the practice of pollinator conservation and management. Demonstration sites will be used as venues for farmer field days and exchange visits, and to facilitate stakeholder interactions between farmers, land managers and policy-makers. In the final year of the project, demonstration sites will host farmers' fairs, featuring and celebrating the mutual benefits of pollinator conservation and sustainable use (including yield increases, quality improvements, promotion of genetic diversity and the addition of value to surrounding natural areas) that an appreciation of pollination services brings.

Supporting the development of national pro-pollinator policies
113. Pollination has not been recognized as an important input or service in either the agricultural sector or the natural resources sector; conservation and management of pollination require a landscape approach, which spans areas under different types of management and decision-making (private, public communal, etc.); and policy-makers have little awareness or understanding of pollination services or its agro-economic value. In view of these obstacles, the project will carefully identify gaps and needs in the policy environment at different levels and discover opportunities to incorporate pro-pollinator

policy into sectoral policies, including agriculture and environment. Results of these efforts will be publicized on the project portal.

114. The project will help promote the development of pollinator-friendly policies and their implementation in partner countries. Sensitization of policy-makers is critical to helping them appreciate the contribution of pollination to agricultural development. Experiences within demonstration sites that highlight opportunities to improve the enabling environment will be documented and shared with policy-makers. Key opportunities and challenges to incorporating pro-pollinator policy into sectoral policies will be identified. It is recognized that a variety of policy frameworks, voluntary measures and economic instruments may be appropriate in different circumstances. A national workshop to promote discussion on policy options will be held in each partner country, and subsequent support allocated to the specific steps prioritized in that workshop to promote pollinator-friendly policy frameworks.

Supporting the development of supra-national pro-pollinator policies

115. The analysis of pro-pollinator policies begun in the project development phase (Annex E) will be further refined on a global level, and will include documenting and analyzing new developments in policies, legislation, economic instruments and intergovernmental agreements that impact pollinator conservation and sustainable use. Development of incentive programs and voluntary measures to support pollination will be encouraged, particularly with respect to the cropping systems that are the focus of the STEP sites. Through FAO's role as an intergovernmental organization, it is intended that project outcomes will be widely disseminated to policy makers and country representatives, through the Committee on Agriculture, Committee on Forestry and the Commission on Genetic Resources for Food and Agriculture.

Sharing of project information

116. Critical to all project components and activities is the sharing of information, which is needed within countries, between countries and globally. It is important to respect the need for material in languages and contexts that are most meaningful to the target audience, while at the same time attaining the broadest reach. Project experiences will have a global impact to the extent that the lessons can be learned on a global level. Activities include identifying relevant material for broadly sharing project experiences, identifying both target recipients and target generators of information and finding the most effective means to share information, including through information technology and exchange programmes. In particular, the project will develop and produce a Generalized Guide to Applying Pollinator Knowledge--a simplified, easy-to-read guide to managing pollination services. The guide will encourage the best use of pollination knowledge, increasing awareness and understanding of the ecosystem approach as it relates to pollination management. It will draw its examples from STEP sites, but will demonstrate the wide applicability of the lessons learned.

117. The core of the information-sharing mechanism for the project will be a web-based information portal, coordinated by FAO during the project phase and afterwards. This will be a web page that provides project information and outcomes, as well as links covering each of the partner sites and other collaborating initiatives. Partners' ability to handle and provide information through information technology will be enhanced, and

each will be encouraged to operate their own national websites. The most current thinking on information technology and maintenance of data standards will guide the development of the portal and websites, as recommended in the IT study undertaken in the project development phase of this project. The web-based pollination portal will include links to the specific outputs produced by the project: the global bibliographic database, pollination thesaurus, relevant databases and publications on pollination services, tools and methods for monitoring pollinator declines, detection of plant pollination deficits, economic valuation tools, taxonomic identification tools, training materials, policy analysis documents and access to the Pollination Information Management System. National-level material will be maintained on national websites and linked to the home portal. Linkages will be established to other relevant initiatives, such as the International Pollinator Initiative website, where global monitoring information, case studies and the project's contributions to the Assessment of the Status and Trends of Pollinators (as addressed by decision VI/5 of the CBD) are maintained.

Project Management

118. National project management units will be established in each partner country, with a project coordinator and logistical and administrative support for project management. On the global level, FAO will also establish a project management unit with a full time global project coordinator. Support for internal monitoring and evaluation, International Steering Committee meetings, Technical Advisory Group, coordination travel and two external monitoring and evaluation missions are included in this component. More details are provided in the section below on Implementation Arrangements, and in Annexes A, Incremental Cost, and Annex R, Public Involvement Plans.

119. In summary, the project will expand national and global levels of knowledge of conservation and management of pollination services in sustainable agricultural systems, and foster the development of national capacities to deploy this expertise in agro-ecosystem management. It will promote pollinator-friendly practices through testing and documentation of cases of successful pollination services management in partner countries, which will provide practical lessons learned for the global community. Databases, training materials, pollinator identification tools and knowledge management systems will be developed that will be important contributions to pollinator conservation on a global level. An enhanced level of public awareness and sharing of information will reinforce the support for pollinator conservation. Policy innovations that mainstream conservation and management of pollination services will be promoted in partner countries and on other levels. Finally, the information developed through the project will be disseminated globally and made accessible to the general public, in accordance with national legislation.

SUSTAINABILITY, REPLICABILITY AND RISKS

120. The specific outcomes of this project will not depend on continued intervention funding after the five-year project period; it is anticipated that pollinator-friendly management practices will have been effectively tested, demonstrated, evaluated and adopted and will become part of agricultural management practices in target communities. Databases on resource needs of pollinators will not go out of date, and

having been once developed, can be added to but will not loose value if there is no further investment; resource needs of pollinators of 100 years ago are the same as today. Countries or partners would need to invest in the development of pollination management systems for other crops not covered by the existing project, to the extent that effective pollination management is recognised as important, using tools developed by this project, but that is outside the scope of project aims. A key feature of the project is the development, improvement and testing of methods for assessing the status of pollinators and their services and evaluating the impact of improved management. This should establish a methodological base that will be more easily replicated in future work to conserve and manage pollination services than is presently possible. Principles and experiences developed through this project are expected to be readily upscaled throughout the agroecosystems underpinning the particular cropping systems that are addressed in the project.

121. On the institutional level, it is not anticipated that new structures need to be built over the life of the project, but that capacity to use the tools and knowledge generated by this project needs to be in place to allow activities to continue. There are a number of outputs of the project that in themselves will assure that the capacity to manage pollination services is increased, both in project sites and beyond. A strong stress on training of trainers and multipliers will ensure that the capacity to understand and use crop pollination information is present in extension services, farmer associations and sustainable agriculture NGOs.

122. The tools and lessons learned will be disseminated over the project webportal, and hard copies of publications distributed to libraries for public access. It is foreseeable that this information base, along with the pollination information management system will be integrated into the agricultural biodiversity website of the Food and Agriculture Organisation at the project end; project partners are also committed to maintaining project outcomes on their institutional websites. The pollinator interaction databases, to be developed by collaborative arrangements with data holders worldwide, will be maintained and updated by a system of distributed databases with data holders taking responsibility for updates and verification. Capacity building material will be consolidated in a distance learning program, and taken over by an institution that has maintenance of distance learning courses as its mandate. Policies to ensure the sustainability of specific interventions on a local level, such as protection of pollinator habitat, will be in place by project end, as this is an explicit outcome of STEP site management plan implementation, and will be addressed during STEP site development.

123. The project has inherent risks and challenges to sustainability, which have been addressed in project design. As a global project, the management and coordination between several countries at great distance from each other poses particular challenges. Project coordination will remain at the Food and Agriculture Organization of the United Nations, ensuring the international reach and professional management standards of the coordinating body. Technical and operations support to the project will be provided by relevant divisions and offices of FAO, including country and regional offices, and a project taskforce within FAO will be established to be consulted in the implementation of the project. The project will also benefit from the technical expertise of FAO's Interdepartmental Working Group on Biodiversity for Food and Agriculture.

Coordination mechanisms and management strategies have been developed for each country and tested for their effectiveness in implementing the project development phase. To the extent necessary, FAO country offices have assisted with implementation in the project development phase and will continue to do so within the full-sized project. Project sustainability will be ensured through the strong partnership that this international, collaborative effort has built.

124. Although the management plans to be developed in this project will benefit from the information gathered in demonstration sites, it may not be feasible for individual farmers and landowners to gather equivalent amounts of information. Each management plan must go from the specific to the general, describing appropriate management for pollinators in the absence of data-intensive information. Several recent research projects have followed this procedure, to allow the research to inform practical recommendations. The scope of recommendations in management plans will apply to the relevant agro-ecosystem, throughout the relevant ecological zone.

125. As with pollination management in general, the development of demonstration sites under Component Two will need to address issues of management across landscapes, often with different landowners. Agreements with landowners for participation in the project over the duration of actively managing demonstration sites will be carefully worked out, and confirmed by all concerned parties.

126. In the project development phase, the state of traditional knowledge of pollination services was assessed, and has in general been found to be highly variable from one individual to the next. The project will respect all international conventions and recommendations on the sensitive treatment of rights over traditional knowledge, and no knowledge will be documented or disseminated without the permission of the rights owner. Each country will be the owner and custodian of data generated within that country, and sharing will be by their agreement.

127. One early risk of the pollination information management system proposed as a central part of Component One is that an elaborate system of information management will have limited data at first. This will indeed be the case at the beginning, before current databases are entered into the system and additional information is captured from existing sources and fieldwork. But the utility of the system is expected to grow over time. The project will not advertise the use of a Pollination Information Management System until its components are functional and able to return useful information. The utility of the system will be restricted to those cropping systems that have benefited from the development of pollinator-friendly management plans, some through this project and others from efforts already underway in Brazil and regional initiatives in North America and Europe. Collaborations between those initiatives and this project will expand the geographic and agronomic coverage of both. The effectiveness of the system will encourage future initiatives to contribute information and datasets, as the value of pollinator conservation and management for sustainable agriculture will be demonstrated.

128. Much of the sustainability of the outcomes of this project depend upon successfully increasing the level of awareness and understanding of the value of pollination services in the minds of farmers, communities and policy-makers. It is an underlying thesis of this

project that sustainability of pollinator conservation will be assured so long as sufficient public awareness has been raised. Farmers and landowners will be motivated to undertake measures to conserve and promote pollination services because it is to their benefit to do so.

129. The functionality of the tools developed through this project and the web portal as a source of information for agricultural systems will depend upon their continued access and maintenance after project completion. Information generated by countries will be maintained in distributed databases, with data owners responsible for their continued maintenance and agreements in place regarding data access. Global information will be the responsibility of FAO. Providing agrobiodiversity information to enhance the knowledge base of sustainable agriculture systems, including management of pollination services in cropping systems, fits entirely with the mandate of FAO as an information provider, and it is envisaged that resources will be availed to update and maintain access to the global knowledge base and information management system after the life of the full-sized project. The Library and Documentation Systems Division of FAO will host the bibliographic metadata and search technology for the global pollination bibliography, and technology for accessing distributed national bibliographic databases. It will also contribute to the maintenance and public access of the pollination thesaurus

130. The capacity-building material to be developed within this project will be incorporated into existing training modalities, such as the farmer field school curriculum made available through FAO and agricultural extension training programmes in partner countries. The distance-learning programme on pollinator management and conservation will be handed over to a host organization by the end of the project.

STAKEHOLDER PARTICIPATION

131. During the PDF-B phase, each of the seven countries examined potential stakeholders and developed lists of key partner institutions, NGOs and associations. Stakeholders have been identified in each country, and representatives invited to initial national stakeholder workshops. These are identified in Annex R. Stakeholders include farmer groups; land managers; extension agents; government ministries involved in agriculture, food security, biodiversity and poverty alleviation; the research community; NGOs involved in biodiversity conservation and sustainable agriculture; and the private sector. Beneficiaries identified include farming communities and consumers of fruits and vegetables, including vegetable seed.

132. After stakeholders have come to understand the importance of conserving pollinator services, interest in the project has been high. All key stakeholder groups have been represented by at least one representative in each national committee and have been consulted on the scope of the stock-taking, project design, country priorities and priority agro-ecosystems. Several stakeholder representatives participated in the stock-taking exercise in each country, contributing to the identification of gaps and alternatives used to design the full project. Several stakeholders with capacity and interest for direct involvement have been identified and selected as national partners, to be involved in the implementation of the project.

133. Many stakeholders wish to remain involved in the implementation phase, including their own contributions of funds and in-kind support. National coordinators will issue project updates on a biannual basis over the duration of the project to the stakeholders expressing an interest. Stakeholders will be invited for farmer field days in demonstration sites. Farmers growing pollinator-dependent crops will be a particular focus of targeted public awareness campaigns, and will be invited to become actively involved in farmer field trials through radio campaigns and extension information.

134. National steering committees, as formulated in each participating country, include a wide cross-section of stakeholders committed to project implementation, such as farmers' cooperatives, NGOs, private corporations, state organizations and universities.

135. Internationally, a wide range of stakeholders have been contacted and have indicated their interest in the outcome of the project. These include the coordinators of other regional initiatives carrying out similar activities in their regions; taxonomic experts willing to assist in the development of user-friendly identification tools; biodiversity information portals, such as the Global Biodiversity Information Facility (GBIF), that are interested in including project-generated data in their database systems; and pollination experts agreeing to serve as resource people. Agreed collaborations are reflected in the project activities above. As project outcomes will have multiple global benefits, the involvement of international stakeholders is a high priority to ensure that the outcomes have the greatest reach.

136. Other international stakeholders include those concerned with good agricultural practices, sustainable agriculture and rural development, who will benefit from a set of tools to better conserve and sustainably use pollinators as a key component of Sustainable Agriculture and Rural Development (SARD). Farmers' groups will benefit by having a better understanding of means to increase crop productivity and crop quality without the use of purchased inputs. Consumers will benefit from the improved quality and quantity of produce that is possible with complete pollination. All of these stakeholders will be targets of the public awareness strategy, to ensure that project outcomes reach and are useful to all stakeholders; their responses will be gauged through the monitoring and evaluation plan.

IMPLEMENTATION ARRANGEMENTS

137. Overall, the project will be managed by FAO, guided by an International Steering Committee (ISC) and supported by a Technical Advisory Group (TAG) (see Figure 2). The ISC will include one member from each partner country, a representative of UNEP/DGEF, a representative of FAO and the Global Project Coordinator (ex-officio). It will meet at least once a year and will remain in contact on key issues between meetings. The committee's secretary will be the Global Project Coordinator. The TAG will have responsibility for providing inputs and advice on the effective technical implementation of the outputs. The TAG will also have three representatives elected by the ISC, and experts providing advice on a needs basis in the areas of:

- monitoring the status and trends of pollinators;
- pollination information management;
- economic valuation of pollination services;

- landscape-level pollination management;
- capacity building; and
- policy analysis.

The composition of the TAG may change according to project needs, and will meet as necessary to guide specific project activities.

138. The national executing agencies will work in partnership with FAO in the execution of the project. In broad outline, each country will establish a National Steering Committee for monitoring and review of project implementation; a Technical Advisory Committee, for technical guidance; Site Teams charged with site planning and implementation; and a Project Activity Coordination Team which will link the different executing institutions in appropriate ways. In each country, the project will establish a national Project Management Unit (PMU) and will appoint a National Project Coordinator. Reflecting the different characteristics of each country, the national implementation arrangements differ somewhat between countries and are more fully described in Annex R.

139. FAO will establish a project management unit (PMU) and will appoint a Global Project Coordinator to ensure the smooth execution of the project. The Global Coordinator will attend meetings of the ISC and the TAG, will advise national executing institutions and Technical Advisory Committees and will ensure the implementation of international-level activities. Technical and operations support to the project will be provided by relevant divisions and offices of FAO, including country, subregional and regional offices, and a project taskforce will be established to be consulted in the implementation of the project.

Figure 2. Project Management Structure, Global Level.

INCREMENTAL COSTS AND PROJECT FINANCING

140. The five components of this project are designed to fill the significant gaps in addressing pollinator conservation and management for sustainable agriculture on a national basis. They take account of, and build on, existing activities worldwide (see Annex H), creating effective and sustainable procedures for an integrated approach to conserving pollination services. Details of incremental costs and description of benefits are provided in Annex A. Table 1 provides a summary of baseline and incremental costs by output and Table 2 gives information on co-funding.

Table 1. Baseline, Alternative and Incremental Costs in US$

Component	Partners	Baseline	Alternative	Increment
Outcome 1	Brazil	100,000	5,235,326	5,135,326
	Ghana	71,500	285,982	214,482
	India	170,000	386,726	216,726
	Kenya	47,600	164,090	116,490
	Nepal	80,000	191,149	111,149
	Pakistan	4,000	142,328	138,238
	South Africa	155,000	456,498	301,498
	Global	140,000	809,729	669,729
	Total	**768,100**	**7,671,828**	**6,903,728**
Outcome 2	Brazil	1,357,804	7,067,169	5,709,365
	Ghana	5,000	347,220	342,220
	India	123,000	389,617	266,617
	Kenya	29,600	232,130	202,530
	Nepal	164,000	287,895	123,895
	Pakistan	9,000	137,199	128,199
	South Africa	100,000	582,896	482,896
	Global	130,000	215,242	85,242
	Total	**1,918,404**	**9,259,368**	**7,340,964**
Outcome 3	Brazil	100,000	3,886,720	3,786,720
	Ghana	80,500	330,268	249,768
	India	337,000	521,573	184,573
	Kenya	71,000	188,239	117,239
	Nepal	0	110,380	110,380
	Pakistan	0	204,457	204,457
	South Africa	50,000	235,586	185,586
	Global	120,000	317,242	197,242
	Total	**758,500**	**5,794,465**	**5,035,965**
Outcome 4	Brazil	500,000	2,731,749	2,231,749
	Ghana	6,500	172,756	166,256
	India	202,000	298,252	96,252
	Kenya	46,500	160,450	113,950
	Nepal	0	50,302	50,302
	Pakistan	0	107,819	107,819
	South Africa	0	63,496	63,496
	Global	214,000	228,852	14,852
	Total	**969,000**	**3,813,676**	**2,844,676**
Project Mgmt	Brazil	0	873,802	873,802
	Ghana	0	65,242	65,242
	India	0	33,742	33,742
	Kenya	0	96,001	96,001
	Nepal	0	58,742	58,742
	Pakistan	0	185,242	185,242
	South Africa	0	233,242	233,242
	Global	0	2,786,657	2,786,657
	Total	**0**	**4,332,670**	**4,332,670**
GRAND TOTAL		**4,414,004**	**30,872,007**	**26,458,003**

Table 2. Component financing in US$

Component	Partner	Increment	Co-funding Govts. In-kind	Co-funding Govts. Cash	Int'l partners In-kind	Int'l partners Cash	Requested from GEF
	Brazil	5,135,326	2,706,647	1,643,632	5,242	0	779,805
	Ghana	214,482	118,600	2,000	5,242	30,000	58,640
	India	216,726	92,600	50,200	5,242	20,000	48,684
Outcome 1	Kenya	116,490	0	26,000	5,242	20,000	65,248
	Nepal	111,149	25,000	0	5,242	50,000	30,907
	Pakistan	138,328	40,794	18,930	5,242	20,000	53,362
	S. Africa	301,498	107,690	84,613	5,242	0	103,953
	Global	669,729	0	0	269,729	400,000	0
	Total	**6,903,728**	**3,091,331**	**1,825,375**	**306,423**	**540,000**	**1,140,599**
	Brazil	5,709,365	1,656,759	2,712,490	5,242	0	1,334,874
	Ghana	342,220	196,600	2,000	5,242	50,000	88,378
	India	266,617	80,100	65,400	5,242	20,000	95,875
Outcome 2	Kenya	202,530	0	26,500	5,242	20,000	150,788
	Nepal	123,895	25,000	0	5,242	70,000	23,653
	Pakistan	128,199	32,281	12,420	5,242	20,000	58,256
	S. Africa	482,896	124,783	173,076	5,242	0	179,795
	Global	85,242	0	0	5,242	80,000	0
	Total	**7,340,964**	**2,115,523**	**2,991,886**	**41,936**	**260,000**	**1,931,619**
	Brazil	3,786,720	1,398,387	1,879,142	5,242	0	503,949
	Ghana	249,768	139,000	2,000	5,242	0	103,526
	India	184,573	44,100	40,000	5,242	0	95,231
Outcome 3	Kenya	117,239	0	4,000	5,242	0	107,997
	Nepal	110,380	25,000	0	5,242	0	80,138
	Pakistan	204,457	95,569	7,084	5,242	0	96,562
	S. Africa	185,586	15,380	0	5,242	0	164,964
	Global	197,242	0	0	80,242	117,000	0
	Total	**5,035,965**	**1,717,436**	**1,932,226**	**116,936**	**117,000**	**1,152,367**
	Brazil	2,231,749	349,965	1,355,170	5,242	0	521,372
	Ghana	166,256	96,100	2,000	5,242	0	62,914
	India	96,252	30,500	24,800	5,242	0	35,710
Outcome 4	Kenya	113,950	30,000	13,500	5,242	0	65,208
	Nepal	50,302	15,000	0	5,242	0	30,060
	Pakistan	107,819	42,555	19,202	5,242	0	40,820
	S. Africa	63,496	0	0	5,242	0	58,254
	Global	14,852	0	0	14,852	0	0
	Total	**2,844,676**	**564,120**	**1,414,672**	**51,546**	**0**	**814,338**
	Brazil	873,802	508,560	0	5,242	0	360,000
	Ghana	65,242	0	0	5,242	0	60,000
	India	33,742	0	0	5,242	0	28,500
Proj Mgmt	Kenya	96,001	0	0	5,242	0	90,759
	Nepal	58,742	25,000		5,242	0	28,500
	Pakistan	185,242	60,000	30,000	5,242	0	90,000
	S'. Africa	233,242	114,000	0	5,242	0	114,000
	Global	2,786,657	0	0	636,637	150,020	2,000,000
	Total	**4,332,670**	**707,560**	**30,000**	**673,331**	**150,020**	**2,771,759**
GRAND TOTAL		**26,458,003**	**8,195,970**	**8,194,159**	**1,190,172**	**1,067,020**	**7,810,682**

MONITORING, EVALUATION AND DISSEMINATION

141. The general and specific objectives of the project, and the list of its planned outputs, have provided the basis for a monitoring and evaluation plan (M&E Plan). The full plan is found in Annex S, and its tracking tools are described in Annex T. Approximately US$690,000 from the total project budget will be allocated for monitoring and evaluation activities to be undertaken by project partners, independent experts and UNEP. US$ 220,000 of the costs of monitoring and evaluation are built on existing project activities, such as undertaking a comprehensive baseline survey of target groups in STEP sites, and developing participatory means of evaluation. The remaining $470,000 is reflected in project management costs, including external reviews and meetings of the international steering committee and the technical advisory group.

142. There will be five entities involved in the implementation of the M&E plan:

- UNEP will receive and review quarterly progress and financial reports from the Project Management Unit (PMU). UNEP will also serve as a member of the International Steering Committee (ISC), will make field visits to assess progress and problems (as needed and agreed with the PMU and ISC), and organize independent evaluations for mid-term and final evaluations.
- The PMU will develop a reporting structure for all project partners and ensure that reporting is timely and complete. It will develop all reports for UNEP, and carry out regular site visits with particular attention to sites experiencing difficulties or delays.
- The ISC will review all reports, advise the PMU on resolving difficulties and increasing efficiency, and monitor progress on the capacity-building component.
- The Technical Advisory Group (TAG) will advise both the ISC and the PMU on resolving technical issues.
- The NSCs will review all national reports and offer policy guidance where needed. They will play a key role in facilitating linkages, both in their respective countries and between countries, and will report on both successes and difficulties within the monitoring process.

143. Project monitoring will be carried out at two levels. The first is the execution performance, which monitors efficiency of project management and supervision. Execution performance tracks both programmatic progress and financial accountability. With support from the PMU, UNEP will carry out this level of monitoring. The second is monitoring of project outputs and milestones. With support from the PMU, FAO will be responsible for monitoring the technical execution of the project, based on the indicators and means of verifying them that are documented in the project logframe, and on the implementation timeframe set out in the timeline (Annex B) and the M&E Plan (Annex S). Biannual progress reports will include assessment of all outputs to be completed within that specific timeframe. Outputs not completed within the planned timeframe will be noted, the reason for delay assessed, and anticipated date of completion cited for tracking purposes.

144. FAO's Department of Technical Cooperation and Division of Finance, with support from the Global Project Manager, will be responsible for developing biannual progress and quarterly financial reports respectively, with inputs from national management units.

These reports will be important monitoring tools, as they will be carefully tracked by both the NSCs and the ISC. These bodies will be responsible for assessing successes, ensuring that effective approaches are replicated to the extent possible, and that difficulties are addressed. When problems arise, members of the NSCs, ISC and TAG are expected to help craft solutions and follow the result of their execution.

145. Participation of all stakeholders is fundamental to this project. Stakeholder participation in the M&E process is also essential to ensure their continued ownership in the project activities. The project expects to develop methods of evaluation in a participatory manner with stakeholders, and to involve stakeholders in subsequent evaluations and reviews of project performance. Mid-term and final evaluation will be conducted by independent evaluators contracted by UNEP.

ANNEX A: INCREMENTAL COST

BROAD DEVELOPMENT GOALS

As agricultural development intensifies, it has traditionally taken a toll on biodiversity and the environment, with simplified monocultures replacing complex ecosystems, and intensified use of agricultural chemicals that impact non-target, as well as target plants and animals. The ecosystem services that support agricultural productivity- including nutrient cycling, watershed functions and pollination- may themselves suffer from such practices, making agriculture ultimately unsustainable. Farming systems have long benefited from pollination services, but if the ability of the ecosystem to provide the service is not carefully maintained, pollinators may face local extinctions. The loss of biodiversity, in this case, is also a loss to sustainable production systems.

This proposed intervention aims to harness the benefits of pollination services provided by wild biodiversity for the mutual benefit of human livelihoods and biodiversity conservation. The project will integrate existing scientific and traditional knowledge on diverse aspects of pollination services into a cohesive source of information. This strengthened and consolidated knowledge base will be made accessible to practitioners in the field, with obvious benefits for conservation and sustainable use of pollination services. Good agricultural practices will be identified, tested and evaluated for pollinator conservation and sustainable use, in selected agro-ecosystems in seven partner countries. The practices so identified will be ones that can be effectively replicated in other parts of the world. In the partner countries, capacity among farmers, the agricultural research and extension community, and policy-makers to work together to design and implement pollination management plans and policies will be built. Last, the project will ensure that the lessons learned are disseminated globally, that public awareness of the role and value of pollination services is enhanced and that measures to conserve and sustainably use pollinators are supported by the policy environment. The result will be a set of tools, methodologies, strategies and best management practices and policies that can be applied to pollinator conservation efforts worldwide.

Global benefits of the project are (a) the conservation of globally significant pollinator diversity; (b) the conservation of associated biodiversity providing resources to pollinators, including associated floral resources and vegetation providing nesting sites in representative agro-ecosystems; (c) the development and dissemination of practices to conserve and manage wild pollination services that can be used both within and outside the project countries; (d) development of an expanded knowledge base and network of expertise on management of pollination services, made accessible globally; (e) provision of information on status and trends of pollinators in representative agroecosystems made available to policymakers (f) development of tools to valuate the costs and benefits of pollination services to human livelihoods and (g) concrete demonstrations of the principle that ecosystem services such as pollination sustain both agriculture and biodiversity conservation, and (h) introduction of innovative practices and policies to incorporate conservation of pollinators in spatial planning.

Domestic benefits of the project are (a) increased food supply of pollinator-dependent crops for local communities, (b) increased capacity to ensure that pollinators are not

eliminated from local agricultural areas, (c) increased incentives for farmers to minimize the use of agricultural chemicals harmful to biodiversity.

BASELINE

All participating countries have the experience, infrastructure and personnel for building capacity of the farming community to adopt good agricultural practices. There are individuals and institutions within each country that have knowledge of pollination systems, although there is a lack of expertise in practical management techniques.

Several countries participating in this project are located in the known centers of biodiversity for pollinating species; Brazil is considered the center of diversity for stingless bees (Meliponini), South Africa has documented many highly unique pollination systems, and the Hindu-Kush region hosts a rich diversity of pollinators from both the Palearctic region and the Oriental region. Several countries are also in the center of origin of pollinator-dependent crops that provide food security and livelihoods for millions of farm families, such as coffee and cucurbits in Kenya. The pollination systems of crops in their center of origin can provide an enhanced understanding of the specific needs of these crops.

Most of the participating countries have developed National Biodiversity Strategies and Actions Plans, in response to their commitments as signatories to the United Nations Convention on Biological Diversity. Many of these plans address agricultural biodiversity and recognise its importance to sustainable livelihoods.

Over the last decade, there has been a strong mobilisation of the community of people and institutions concerned with pollinator losses, in many instances lead by the project partners. The actions needed to secure pollinator conservation for sustainable agriculture are well identified, but need investment to surmount the existing threats and barriers.

The project components have been designed to address the overall project baseline assumptions:

1. The existing knowledge base on pollinator conservation and management for sustainable agriculture is fragmented and largely inaccessible to pollination practioners in developing countries.
2. There is a lack of tested and carefully evaluated good agricultural practices to promote wild pollination services in farming systems.
3. There is insufficient capacity to develop management plans that conserve and promote pollination as an ecosystem service.
4. Insufficient awareness of pollination is reflected in the lack of a policy environment that facilitates and ensures the conservation of pollinators.

Expanded knowledge base

In each of the partner countries, there is a concern with the perceived losses of pollinators under agricultural development, although Brazil is the only country with a systematic program to monitor the status of endangered pollinators.

National agricultural research programs exist in all countries that focus on production limitations for key pollinator-dependent crops. While pollination is rarely included in such research programs, the existence of a knowledge base on other aspects of crop productivity provides a strong basis for addressing pollination needs.

Taxonomic expertise for the identification of bees exists in both South Africa and Brazil; in fact, these experts provide taxonomic assistance both globally and to their respective continents. But as pollination services are recognised for their value, there is an increasing dearth of local expertise to identify key pollinators.

The primary data about plant-pollinator relationships are embodied in, and vouchered by, specimens and their associated data in natural history collections, along with documented observations of plants and animals in nature. This material is dispersed throughout the world with different institutions/collections having very different qualities of storage and ease of retrieval of specimens and information. While the material has tremendous value for pollination practitioners, it is currently virtually impossible to use primary biodiversity data as a basis for decision-making and development of pollination management systems. The basic primary data, however, constitutes a substantial baseline cost.

Governments of several of the participating countries are ready to recognise ecosystem services, but lack well-verified figures for assessing the contribution of such services to the domestic economy.

The baseline cost for this project component is estimated to be $768,100. These costs include existing taxonomic services, monitoring efforts in Brazil, and on-going support to pollination research in several countries (South Africa, Pakistan, Kenya and India) that for the most part focuses on management of domestic species such as the honeybee. This baseline reflects cash expenditures by national governments and other donors, in-kind contributions of national partners in terms of salaries and infrastructure, and the on-going costs of existing information management for biodiversity.

Extension and promotion of pollinator-friendly good agricultural practices

The partner countries all depend heavily on agricultural production for domestic revenues, from providing more than one-third of domestic revenues in Brazil (equivalent to 180 billion USD) to almost forty percent in Nepal. As such, each country makes a substantial investment in their agricultural sector and the promotion of practices to ensure sustained productivity.

Efforts to reduce the overuse of agricultural chemicals have been underway in all partner countries. In many instances, farmers have been working with extension workers and

researchers to identify practices that reduce losses to pests and disease through ecosystem approaches, such as increasing habitat for beneficial insects on-farm.

There are existing programmes in several partner countries to manage the pollination needs of key crops, almost entirely through the use of domesticated honeybees. This often includes substantial expenditures on the part of farmers.

The baseline cost for this project component is estimated to be $1,918,404, based on on-going project-related activities which include development of the agriculture sector and targeted initiatives for pollinator-dependent crops, programmes in Integrated Pest Management, and honeybee research and management.

Capacity building

This project's ultimate impact will be on the capacity of farmers, land managers and decision makers to incorporate pollination considerations in their work. The importance of developing good agricultural practices in a participatory manner with target groups is central to project success.

The project countries recognize the importance of building the capacity of these target groups, and invest in extension and outreach activities in the regions that the project will be working. They also provide secondary and tertiary educational systems that in some cases educate students on pollination services, or could be modified to cover subjects that will build capacity in the conservation and management of pollinators. There is thus educational programs and infrastructure that forms a baseline for training programs for the management of pollination services. In addition, a considerable number of personnel in project countries have been trained in farmer group facilitation and farmer field school methods.

The baseline for this project component is $ 758,500. This estimate is based on the costs of existing capacity building personnel and training programmes that provide a starting point for project activities, including IPM and Farmer Field Schools, farmer association training programmes, and extension activities. This also includes the investment in teaching and research programmes for degree studies at national universities that will provide a framework for investigations in demonstrations sites.

Public awareness, mainstreaming and information-sharing.

There are some initiatives and public programmes, within most of the project countries, to increase the level of public understanding and appreciation of biodiversity; increasingly, this includes not just charismatic large animals, but also the many small organisms providing ecosystem services. The existence of various public awareness programmes, such as regular radio programmes for farmers, provides a venue for enhancing the public's understanding of the importance of pollinators.

Each of the partner countries have developed domestic policies and legislation addressing needs for sound agricultural policies, as well as biodiversity conservation. Food security is an important feature of the poverty reduction strategies of several of the participating countries. There are, however, rarely policy links between the agricultural sector and the

biodiversity sector, even if there are synergies and means by which one supports the other.

The costs of disseminating information are decreasing, and the reach of networks for electronic dissemination are increasing quickly in partner countries as Internet becomes more common. With electronic publishing, there is a greater ease of using color photographs and graphics that can greatly assist to convey complex topics in accessible terms. But there is a lack of locally useful material, developed with local communities as a target population.

The estimated baseline cost of this component is $ 969,000. This estimate is a based on the costs of current public awareness campaigns and programmes that can incorporate coverage of pollination, and existing initiatives to develop legislation and policies to conserve biodiversity and promote sustainable agriculture.

GLOBAL ENVIRONMENTAL OBJECTIVES

The project will conserve biodiversity in project sites that provides a critical ecosystem service and benefit to food security and food quality. Integrated systems of ensuring crop production while conserving on-farm biodiversity will be identified tested and promoted. The systems to be promoted will be resource-conserving and less toxic to biodiversity than conventional farming systems. Thus, there should be reduced environmental contamination for pro-pollinator production systems. Additional global biodiversity benefits that will accrue through the application of this approach will include other crop-related biodiversity such as beneficial insects and soil organisms. Pro-pollinator systems focus on the benefit of additional aspects of biodiversity, such as floral associates of pollinators in addition to crops, and vegetation that provides nesting sites. In a general sense, the practices to be identified and promoted through this project will conserve a greater diversity of species- in particular of plants, insects, and microfauna- in agricultural areas, recognising that such diversity is beneficial to the health and sustainability of production landscapes. In this sense, the conservation of wild biodiversity in cropping systems will be recognised for its value and conserved.

GEF ALTERNATIVE

The project will develop a set of tools and databases of great utility to pollination practitioners around the world to understand crop pollination needs and to identify and conserve effective pollinators. Conservation of biodiversity in farming landscapes will become a method for ensuring stability and sustainable production, and an incentive to reduce the use of agricultural chemicals.

Expanded knowledge base

An integrated information management system for conservation and management of pollination services will be developed that will be useful to project partners and others concerned with crop pollination globally. The information system will make the literature base on priority crop pollination information easily accessible and searchable by crop, pollinator and associated biodiversity. Tools and networks will be established to permit accurate, replicable information on the status and trends of pollinators in key cropping systems, providing information from developing countries that is an outstanding gap in

global monitoring. The project will make important contributions to the understanding of pollination deficits and landscape management of pollination. It will develop tools and protocols for the economic valuation of pollination services that can be used in different cropping systems and will provide the global community with a means of evaluating market and non-market values of this ecosystem service. The project will facilitate the development of accurate, complete and authoritative databases from natural history collections on pollinator interactions that will profoundly change accessibility to such data and make it useful to field practitioners.

The incremental cost of this project component is estimated to be US$ 6,903,728 of which national governments will provide co-financing of US$ 3,091,331 (in-kind) and US $ 1,825,375 (cash) to cover salaries of staff participation and use of facilities for activities in Component 1 including: database development, data basing of literature, undertaking field surveys for monitoring, assessing plant pollination limitations and gathering information for the evaluation of market and non-market values of pollination services, vehicle use for surveys, processing and maintenance of insect specimens, staff costing via cash co-funding and organising the logistical arrangements for undertaking these surveys. International co-financing estimated at $41,936 in in-kind logistical support and $90,000 cash support from FAO for technical assistance and project coordination will support the development of a pollination bibliographic system and effective search facility, establishment of a monitoring program on status and trends of pollination services for indicator cropping systems, the production of protocols, tools and increased understanding of plant pollination limitation, landscape management of pollination services and valuation of pollination services, the development of tools to identify pollinators, and the development of the global Pollination Information Management System. $75,000 in-kind and $200,000 cash from the Global Biodiversity Information Facility will support the development of plant pollinator interaction databases; $150,000 in kind and $150,000 cash from ICIPE will contribute technical support in developing agroecosystem management systems for pollinators; $100,000 cash from IFAD will support the development of means of valuating pollination services, and $39,487 in-kind support will contribute technical advice from the Center for Development Research at the University of Bonn, University of California, Berkeley, and the Bee Biology Laboratory of the United States Department of Agriculture. GEF funds from national allocations under GEF-4 totalling $1,140,599 will enable participating countries to build and consolidate their national knowledge base, develop procedures for monitoring pollinators and determining crop pollination deficits, identify landscape level interventions for pollinator conservation and contribute to the development of the Pollination Information Management System.

Extension and promotion of pollinator-friendly good agricultural practices

Farming communities, land managers and national partners will together gather information on pollination needs in priority cropping systems, and design management plans that document the benefits of wild pollination services, indicate pollinator-friendly good agricultural practices, and promote the value of these practices in farming systems. Specialised tools for management of ecosystems services over landscapes, using participatory mapping activities, will be developed. Surveys of good agricultural practices from a diversity of farming communities and ecosystems will be compiled and

made available, and means of evaluating agricultural practices for their effectiveness in conserving pollination services will be developed and disseminated. The lessons learned for communities, land managers and policy makers in developing explicit management plans for pollination services will be highlighted for local communities, and general guidelines extracted from these experiences for the global community.

The incremental cost of this project component is US$ 7,340,964 of which national governments will provide co-financing of US$ 2,115,523 (in-kind) and US2,991,886 (cash) to cover contribution of personnel for the staff time, rental cost of STEP sites; infrastructure for GIS facilities; field and laboratory costs, use of laboratory facilities, time commitments from policy makers, farmers and managers in developing, implementing and evaluating management plans, farmers' contributions of access to land and logistical arrangements associated with operating demonstration sites. Co-financing at US$ 41,936 (in-kind) and US$ 260,000 (cash) will be provided by UN FAO and IFAD to compile global surveys of good practices, provide scientific backstopping in the development of management plans, develop and disseminate evaluation tools to systematically assessing the impacts of practices on pollinators respecting a diversity of success criteria from local to global benefits and costs, and translating lessons learned into general guidance for farm communities. The GEF funds of US$ 1,931,619 from national allocations will be used for the development, testing and evaluation of management plans in each partner country, and dissemination of lessons learned.

Capacity building

Capacity to use the expanded knowledge base on pollination developed through Component One and the pollinator-friendly good agricultural practices identified, tested and documented in Component Two, will be built on multiple levels. Trainers such as extension agents and other multipliers and the farmers they work with will develop capacity to develop, use and apply pollinator management plans. Training activities will permit farmers and farming communities to assess and incorporate pollination conservation measures in the context of sustainable agricultural systems, including the wider dimensions of marketing and incentives for provisioning of environmental services. Capacities will also be built in farmer organisations, NGOs, educational institutes, members of the media and policymakers. In countries where farmer practices are best modified through scientific research and demonstration, student projects will be used to build skills in the scientific community that can provide sound evidence to farmers. Needs in capacity building will be continually reassessed, and appropriate training materials to answer such needs will be developed.

The incremental cost of this project component is US$ 5,035,965 of which national governments will provide co-financing of US$ 1,717,436 (in-kind) and US 1,932,226 (cash). National funds will cover staff time of personnel trained in capacity building, internships, support for post graduate students, training facilities, training on parataxonomist knowledge, staff time of experts in capacity building; meeting partial expenditure of farmers training; logistic support for conducting activities of component 4, including some local travel costs, and time contributions from institutes, universities and colleges. FAO and other international partners, including collaboration with the ARPPIS programme run by the International Centre of Insect Physiology and Ecology in Kenya will be providing US$ 116,936 in in-kind support and US$ 117,000 cash, to support

technical assistance in the implementation of capacity building programmes, and developing distance learning programmes and other tools to build skills in the management of wild pollination services. The GEF funds of US$ 1,152,367 from national allocations will be used development of training materials, training of multipliers, and in costs associated with specialised training courses, for personnel in existing organisations, and for taxonomic training.

Public awareness, mainstreaming and information-sharing.

The project outcomes will be sustained through various measures to ensure that project outcomes are adopted beyond physical demonstration sites and trained personnel. Project findings will be promoted in public awareness campaigns, targeted to key audiences. Polices will be identified that promote conservation and wise management of pollination services, as a means of replicating good agricultural practices in multiple locations. The dissemination of all project information, from the information management system, to lessons learned in STEP sites, to capacity building material, means of raising public awareness and pro-pollinator policy analysis, will ensure that project outcomes are shared on a global level, and can serve to secure the global benefits of conserving pollination services.

The incremental cost for this project component is US$ 2,844,676. National governments will contribute US$ 564,120 in in-kind contributions, and US$ 1,414,672 cash contributions. National funds will be used for staff time on public awareness assessments and campaigns, preparation of awareness raising material, staff time for policy development and environmental education, for local participation in the pollinator policy workshops, and in logistical support for these activities. On an international level, FAO, the International Institute of Environment and Development and Wren Media will contribute $51,546 in kind for activities serving to bring increased awareness of pollination services into global venues of policymakers, to provide technical backstopping in the formulation of pro-pollinator policies, and to ensure sharing and dissemination of project outcomes on an international level. The GEF funds of US$ 814,338 from national allocations will be used for implementing public awareness campaigns in partner countries, and translating and disseminating project outcomes to the global community.

Project Management

The incremental cost of the project management component is estimated at US$ 4,332,670 The funds requested from GEF of US$ 771,759 for this component on a national level will support National Project Management Units, which include a full time National Project Manager or Coordinator in each country, and direct administrative costs. $2,000,000 of GEF funds will be applied towards the costs of a full time global project coordinator, global coordinator's travel, International Steering Committee meetings, and Technical Advisory Group meetings and missions, global outcomes and information dissemination, internal monitoring and evaluation and midterm and final external evaluations of the project as per the budget described in the Monitoring and Evaluation plan (Annex S). FAO will contribute US$ 673,331 in kind and US$ 150,020 cash to project management, including logistical and administrative backstopping, office space and supplies. National Project coordination mechanisms, including national steering

committee meetings, are covered by national in-kind and cash contributions, as well as office and workshop facilities, meeting space, office equipment, salaries of staff assisting with the project, partial internet costs, administrative, secretarial, IT and logistical support. Total contribution of national governments and organisations for this component is US$ 707,560 (in-kind) and US$ 30,000 cash.

COSTS

The incremental costs and benefits of the proposed project are summarized in the following incremental cost matrix. Baseline expenditures amount to US$ 4,414,004, while the alternative has been estimated at $ 30,872,007. The incremental cost of the project, US$ 26,458,003 is required to achieve the project's global environmental objectives of which the amount of US$ 7,810,682 is requested from GEF. This amounts to 25.0 % of the total costs of the alternative. The remaining amount, US$ 23,061,325 (representing 75.0 % of the total alternative cost of the Full Project), will come the in-kind and cash contributions from the national and international partners and other donors, in addition to the baseline.

TABLE 1: COSTS AND INCREMENTAL ANALYSIS

	Baseline (B)	**Alternative (A)**	**Increment (A-B)**
Global Benefits	• Lack of knowledge to conserve and manage wild pollination services, • Means to ensure sustainability of agricultural production through biodiversity are lost. • Desirable levels of fruit and seed production and quality not realised. • No systematic efforts to catalogue effective pollinators and their resource needs. **Baseline: US$4,414,004**	• Conservation of globally significant pollinator diversity. • Conservation of associated biodiversity providing resources to pollinators: associated floral resources and nesting sites. • Development of practices to conserve and manage wild pollination services that can be used both within and outside the project countries. • Economic and non-economic values of biodiversity in agricultural landscapes is understood. **Alternative US$30,872,007**	**Increment: US$ 26,458,003**
Domestic Benefits	• Decreased crop production when crops are grown under pollinator-unfriendly systems. • Increased use of hand-pollination and reliance on managed honeybees, with attendant risks of pests and diseases in managed bee systems. • Farmer knowledge of good agricultural practices supporting pollination services is not documented.	• Increased food supply of pollinator-dependent crops for local communities. • Increased capacity to ensure that pollinators are not eliminated from local agricultural areas. • Increased incentives for farmers to minimize the use of agricultural chemicals harmful to biodiversity.	

Outcome 1: **Integrated and accessible knowledge base for management of wild pollination services, for farmers, land managers and policy makers**	• Pollination not understood as an agricultural input • Status and trends of pollinators remains undocumented • Ecological knowledge in specimen data about pollinators is inaccessible and unused • Pollination services not included in valuations of biodiversity and land management Brazil $100,000 Ghana $71,500 India $170,000 Kenya $47,600 Nepal $80,000 Pakistan $4,000 South Africa $155,000 Global $140,000 **Total: $768,100**	• Integrated information systems, based on expert knowledge of pollination management developed and accessible to the global community • Status and trends of pollinators documented in diverse agroecosystems. • Landscape management of pollination services understood. • Tools for pollinator identification developed and used. • Ecological knowledge captured over centuries in museum data made accessible and useful. • Pollination services included in valuations of biodiversity and land management. Brazil $5,235,326 Ghana $285,982 India $386,726 Kenya $164,090 Nepal $191,149 Pakistan $142,328 South Africa $456,498 Global $809,729 **Total $7,671,828**	Brazil $5,135,326 Ghana $214,482 India $216,726 Kenya $116,490 Nepal $111,149 Pakistan $138,328 South Africa $301,498 Global $669,729 **Total: $6,903,728** **Co-finance:$5,763,129** **Cost to GEF:$1,140,599**
Outcome 2: **Enhanced conservation and sustainable use of pollinators**	• Pollination not managed as an agricultural input • Sustainability and reliability of agricultural production of pollinator-dependent crops is undermined. • Existing farmer practices that are pollinator-friendly are not promoted.	• Best practices to conserve and manage wild pollination services documented. • Pollination management plans for priority cropping systems developed, tested, and evaluated. • Lessons shared with local communities. Generalised guidelines on development of pollination management plans developed for	

	Brazil $1,357,804 Ghana $5,000 India $123,000 Kenya $29,600 Nepal $164,000 Pakistan $9,000 South Africa $100,000 Global $130,000 **Total: $1,918,404**	Brazil $7,067,169 Ghana $347,220 India $389,617 Kenya $232,130 Nepal $287,895 Pakistan $137,199 South Africa $582,896 Global $215,242 Total: **$9,259,368**	Brazil $5,709,365 Ghana $342,220 India $266,617 Kenya $202,530 Nepal $123,895 Pakistan $128,199 South Africa $482,896 Global $85,242 **Total: $7,340,964** **Co-finance: $5,409,345** **Cost to GEF:$1,931,619**
Outcome 3: **Increased capacity for conservation and sustainable use of pollinators**	• Training to manage wild pollination services for pollinator-dependent crops is not available. • Training material on management of pollination services not available. • No local expertise in identification of pollinators. Brazil $100,000 Ghana $80,500 India $337,000 Kenya $71,000 Nepal $0 Pakistan $0 South Africa $50,000 Global $120,000 **Total: $758,500**	• Trainers and multipliers have capacity to guide farmers and land managers in the development of pollination management plans. • Stakeholders trained in areas of expertise needed for roles in conserving and managing pollinators for sustainable agriculture. • Training material of management of wild pollination services is available. Brazil $3,886,720 Ghana $330,268 India $521,573 Kenya $188,239 Nepal $110,380 Pakistan $204,457 South Africa $235,586 Global $317,242 **Total: $5,794,465**	Brazil $3,786,720 Ghana $249,768 India $184,573 Kenya $117,239 Nepal $110,380 Pakistan $204,457 South Africa $185,586 Global $197,242 **Total: $5,035,965** **Co-finance: $ 3,883,598** **Cost to GEF:$1,152,367**
Outcome 4:	• Public and policy makers remain unaware of the value of pollination services.	• Public awareness and appreciation of pollination services is enhanced.	Brazil $2,231,749 Ghana $166,256

Enhanced awareness of conservation and sustainable use of pollinators for the general public and for policymakers	• Polices do not consider means of conserving and promoting pollination services for sustainable agriculture. • Information base on pollination is not accessible Brazil $500,000 Ghana $6,500 India $202,000 Kenya $46,500 Nepal $0 Pakistan $0 South Africa $0 Global $214,000 **Total: $969,000**	• Policy briefs developed that identify appropriate policy measures to conserve and manage wild pollination services for sustainable agriculture • Information exchange and mainstreaming of good agricultural practices for pollination management, through national and regional workshops. • Knowledge base on pollination disseminated and accessible. Brazil $2,731,749 Ghana $172,756 India $298,252 Kenya $160,450 Nepal $50,302 Pakistan $107,819 South Africa $63,496 Global $228,852 **Total: $3,813,676**	India $96,252 Kenya $113,950 Nepal $50,302 Pakistan $107,819 South Africa $63,496 Global $14,852 **Total: $2,844,676** **Co-finance: $2,030,338** **Cost to GEF: $814,338**
Project management		• Effective national and global collaboration to produce the project outputs with active stakeholder participation and systems of monitoring and evaluation that strengthen programme implementation.	Brazil $873,802 Ghana $65,242 India $33,742 Kenya $96,001 Nepal $58,742 Pakistan $185,242 South Africa $233,242 Global $2,786,657 **Total: $4,332,670** **Co-finance: $1,560,911** **Cost to GEF:$2,771,759**

ANNEX B: LOGICAL FRAMEWORK AND WORKPLAN

Table 1. Project Planning Matrix (PPM)	**Project title: "Conservation and Management of Pollinators for Sustainable Agriculture, Through an Ecosystem Approach"**	**Date: 21.03.2007**	**Page 1**

Objectives and outcomes	Objectively verifiable indicators	Means of verification	Important assumptions
Development objective: **Improved food security, nutrition and livelihood through enhanced conservation and sustainable use of pollinators**	• At least 495,000 ha of land under target cropping systems in the area surrounding STEP sites is managed with good agricultural practices for pollinator conservation and sustainable use by project end. • 20% of farmers in more than 430 local communities in the area surrounding STEP sites improve crop production by 10% and crop quality through better conservation and management of pollination services by project end.	• Land-use and farmer practice survey, at beginning and end of project;	• Political stability (biodiversity and pollinators still priority) • Priority crops remain important to local economies.
Immediate objective: **Benefits of pollination services provided by wild biodiversity harnested for human livelihoods and sustainable agriculture, through an ecosystem approach in selected countries**	• Number of users of the expanded knowledge base on pollination will increase by 20% annually from time of initial development ot project end. • At least 20% of farmers in the area surrounding STEP sites will implement good agricultural practices to conserve and sustainably use pollination services by project end. • Public awareness of pollination services increased by 15% in target groups around STEP sites through public awareness campaigns by project end. • Policy recommendations that support and strengthen conservation and sustainable management of pollination services are developed, submitted to policy makers and incorporated in national strategy documents in at least two countries by project end.	• User statistics • Land-use and farmer practice survey, at beginning and end of project. • Public awareness survey at beginning and end of project. • National policy papers, and project reports.	• Financial support is available for full project activities. • Capacity building and awareness raising are utilized. • The public is interested in pollination issues. • Conservation of ecosystem services is relevant to the agenda of policymakers.

Outcome 1: **Integrated and accessible knowledge base for management of wild pollination services, for farmers, land managers and policy makers**	• Practices to conserve and sustainably use wild pollinators and address crop pollination deficits are incorporated in at least two pollinator-dependent crop management plans in STEP sites in at least four partner countries by end of third year, and each year afterwards. • Socio economic valuations of pollination services are available for at least one agroecosystem per country and outcomes findings are transmitted to and considered by policy makers by end of fourth year. • 50% of key pollinators for three target crops per country can be identified within each partner country by end of second year. • Pollination information management system is annually accessed by 3000 users, from time of initial development to end of project.	• Project reports and publications on monitoring results. • Project reports and publications on economic assessment. • Project reports and publications on plant pollination deficits. • Project reports and publications of identification guides. • User statistics, project reports and publications.	• Analytical methods are robust for handling pollinator data. • Local communities and scientific communities collaborate with the project and share knowledge. • Economic methods adequately capture ecosystem service valuation. • Existing tools for developing user-friendly guides are adaptable to pollinators. • Databases are accessible.
Output 1.1 An expanded knowledge base and tools accessible to pollination practitioners	• Pollination bibliographic database compiled and made accessible by end of first year. • Pollination thesaurus developed, used in AGROVOC and as search utility for bibliographic database by end of first year. • Monitoring program on indicator systems of pollinator status established and implemented by end of second year. • Pollinator interaction databases compiled at end of third year, with yearly updates thereafter. • Pollination Information Management System developed and made accessible to the public at end of third year.	• Distributed database available, on national and global levels. • Project reports and publications. • Pollination Information Management System • Project reports and publications	• Scientific experts cooperate with the project. • Communities are receptive to monitoring programs • Extensionists and multipliers are interested in using tools developed to manage pollination systems.

Output 1.2 Guidelines and publications on plant pollination limitations, agroecosystem management of pollination services, and socio-economic valuation of pollination.	• Guidelines on detection of plant pollination limitations established, by end of third year. • Guidelines on identifying and sustaining pollinator effectiveness and availability in agricultural landscapes, by end of fourth year. • Economic assessments of the value of pollination services published, one for each country, by end of fourth year.	• Guidelines and publications	• Scientific experts cooperate with the project.
Output 1.3 User-friendly tools for pollinator identification.	• Laminated field guides to effective pollinators produced at end of second year. • User-friendly identification guides published for bee genera on regional grouping at end of fifth year.	• Project reports and identification guides.	• Scientific experts cooperate with the project.
Outcome 2: ***Enhanced conservation and sustainable use of pollinators***	• Practices that conserve and enhance pollinator populations are adopted on at least 20% of land area under target cropping systems in the area surrounding STEP sites by end of project. • 20% of farmers in the area surrounding STEP sites using good pollination practices have 10% increases in crop yields and measurable improvements in crop quality by end of project.	• Project reports and publications that include evaluations of STEP site progress • Project reports and publications that include survey of best practices	• No natural calamities cancel the benefits of pollinator conservation • Local communities and scientific communities collaborate with the project and share knowledge • Pollinator friendly policies and incentives are accepted as part of management plans by policymakers and farmers
Output 2.1 Development and testing of pollinator-friendly management plans	• At least two pollinator-friendly management practices developed and tested in management plans for one priority cropping system in each country by end of fourth year.	• Project reports and publications	• Farmers are receptive and interested. • Extensionists and multipliers are interested in working with communities and partners to develop pollination management plans.
Output 2.2 Documentation of practices and tools for	• Global survey of good pollination practices completed, at end second year. • Publication of evaluation tools for demonstration	• Survey results • Guidelines and publications	• Commitment of project partners remains strong

evaluation and development of management plans	sites at end of second year. • Publication of results of evaluations of management interventions in demonstration sites, and description of local-level good agricultural practices, at end of fifth year. • Manual produced on the development of pollinator management plans at end of project.		
Outcome 3: **Increased capacity for conservation and sustainable use of pollinators for farmers and land managers.**	• At least 20% of the farmers of the project site regions introduce good agricultural practices to conserve and manage wild pollination services on their farms by end of project. • In at least one STEP site per country, at least two local area decision making meetings have been held, with participation by farmers trained through the project, to address and improve landscape-level practices to conserve pollination services by end of project.	• Project reports on capacity building • Surveys at beginning and end of project.	• Target groups motivated to participate and make use of capacity.
Output 3.1 Enhanced capacity of farmers and multipliers to conserve and use wild pollination services	• Published training material for farmer groups produced by end of fourth year. • At least one participatory research training program/farmers group in support of pollination management developed in five countries by end of year three.	• Needs assessment results • Project reports and publications • Training material	• Multipliers and farmers are receptive and interested
Output 3.2 Enhanced research capacity for management of pollination services	• At least two post-graduate students trained in pollination management for sustainable agriculture by end of year four.	• Project reports and publications.	• Scientific experts cooperate with the project.
Output 3.3 Tools for building capacity in management of pollination services	• Distance learning course developed by end of year four. • Roster of experts in pollination management developed and made available by end of year three.	• Distance learning course • Roster	• Scientific experts cooperate with the project. • Multipliers are receptive and interested.

Outcome 4: **Mainstreaming of pollinator conservation and sustainable use**	• Levels of public awareness, as determined by survey at project beginning and project end, are increased by 15% by end of project. • Policy recommendations that support and strengthen conservation and sustainable management of pollination services are developed, submitted to policy makers and incorporated in national strategy documents in at least two countries by project end.	• Project reports and publications; news monitoring reports • News monitoring reports, project reports and publications on policy matters	• Media interested in pollination issues. • Policy-makers interested in pollination issues.
Output 4.1 Campaign for increased public awareness of the role of pollinators	• Survey of public awareness completed at project beginning and end, showing significant increase in public awareness	• Survey results	• Public is receptive and interested.
Output 4.2 National dialogue on pro-pollinator policy	• Four national policy workshops organised by end of year four • Policy recommendations formulated and submitted to policy makers in all countries by end of year five.	• National policy papers • Project reports and publications	• Policy-makers perceive pollination as relevant and valuable to their constituencies.
Output 4.3 Information portals on national and global levels	• Information disseminated through web portal is accessed by 20% over each year of the project.	• Web-based information portal	• Extensionists and multipliers are interested in gathering information for working with communities and partners to develop pollination management plans.

Activities and time table by Outcome	**Project: "Conservation and Management of Pollinators for Sustainable Agriculture, Through an Ecosystem Approach"**				
Component 1. Expansion of the Knowledge Base	**Planning period:** September 2007 –August 2012			**ANNEX B**	
Activities Sub-activities	Timeframe Years				
	1	**2**	**3**	**4**	**5**
1.1. Update literature review and database design; development of thesaurus					
1.1a. Develop common platform for literature databases. *(completed in PDF phase)*					
1.1b. Develop means of archiving literature and ensuring access.					
1.1c. Develop a common pollination thesaurus.					
1.1d. Complete databasing of pollination literature. *(begun in pdf phase)*					
1.1e. Maintain literature databases on annual basis/monthly.					
1.1f. For articles relevant to Study, Training, Evaluation and Promotion (STEP) site agroecosystems, obtain or create abstracts of all articles, and select keywords, and archive					
1.1g. Carry out literature analyses/reviews on selected topics relevant to development of STEP sites (Plant reproductive biology and pollination, known pollinators in specific agro-ecosystems, cropping system and pollinators, pollinator decline/pollen limitation, implication of change land use and pollination systems) to be presented in PIMS, webportal.					
1.2 Refine methods and carry out monitoring of pollinator declines/deficits as a contribution to a global assessment of the State of the World's Pollinators					
1.2a. Identify survey methodologies, including intensive and rapid assessment methods, and for non-bee pollinators *(begun in pdf phase)*					
1.2b. Test survey methodologies *(begun in pdf phase)*					
1.2c. Collaborations developed/reinforced with other continental assessments for harmonization and sharing/ Agree on methods amongst partners and other collaborators					
1.2d. Carry out surveys; intensive in Study, Training, Evaluation and Promotion (STEP) sites, rapid assessments as proscribed in survey protocol.					
1.2e. Document results, pooling information into common database to be presented in PIMS, webportal.					
1.2f. Document procedures, publish manuals on standard methods.					
1.3 Extend knowledge base of plant pollination services and detection of pollen deficits					
1.3a. Survey of existing knowledge (begun in pdf phase)					
1.3b. Identify priority crops dependent on pollinators for which pollen limitation questions are critical. *(begun in pdf phase)*					
13c. Identify experts able to contribute to discussion and publication on detection, rapid assessment and treatment of plant pollination deficits in sustainable agriculture.					
1.4c. Covene expert e-mail discussion on needs and gaps in knowledge, scope of publication.					
1.4e. Commission papers on detection and treatment of plant pollination deficits					

1.4f. Convene authors' workshop, to peer review papers.					
1.4g. Edit papers for technical publication, design, layout and publish.					
1.4h. Edit key findings into a publication for a broader target audience of extension workers, agricultural schools, non governmental organisations.					
1.4 Extend knowledge base on interactions between agro-ecosystems and pollination management.					
1.4a. Develop research agendas for investigations of priority cropping agroecosystems and interactions with pollination management, including identifying threats/benefits of different agro-ecosystems to pollinators, assessing contribution of natural ecosystems, and considering the impact of spatial and temporal features of agro-ecosystem structure and practices on pollinators. *(begun in pdf phase)*					
1.4b. Recruit post graduate students able to address research questions on areas identified in 1.5a in Study, Training, Evaluation and Promotion (STEP) sites.					
1.4c. Carry out targeted research on areas identified in 1.5a in STEP sites.					
1.4d. Convene workshop of practitioners, researchers and advisors to present results and synthesize findings.					
1.4e. Edit papers for technical publication, design, layout and publish.					
1.4f. Edit key findings into a publication for a broader target audience of extension workers, agricultural schools, non governmental organisations.					
1.5 Extend knowledge base on assessing the socio-economic value of pollination					
1.5a. Develop robust framework of valuation of pollination as an ecosystem service, with indications of how cropping systems specificities can best be handled *(begun in pdf phase).*					
1.5b. Develop protocols for collection of information, including community participation. *(begun in pdf phase).*					
1.5c. Gather needed information and assess the actual and potential economic and subsistence or cultural values of pollination to crops, and the contribution of managed and wild pollinators to these values.					
1.5d. Convene workshop of practitioners, users, researchers and advisors to present results and synthesize findings.					
1.5e. Edit papers for technical publication, design, layout and publish.					
1.5f. Edit key findings into a publication for a broader target audience of extension workers, agricultural schools, non governmental organisations, to raise awareness of pollination as an input of production.					
1.6 Develop tools and networks for pollinator identification.					
1.6a. Establish a network of taxonomic services for key pollinator groups (bees, flies and beetles) in Study, Training, Evaluation and Promotion (STEP) sites, and rapid assessment sites.					
1.6b. With technical oversight by taxonomic advisors, develop simple laminated field guides to key pollinators of Study, Training, Evaluation and Promotion (STEP) sites.					
1.6c. Develop user-friendly identification keys to pollinator genera, by region and publish on internet and CD.					
1.7 Develop Pollination Interaction Database					
1.7a. Collect relevant information on expertise, crop pollination needs, effectiveness of pollinators, distribution of pollinators, alternative forage resources, nesting sites, dispersal ability, inter-specific competition, parasitism and predation impacts, impacts of alien species, known pesticide susceptibility, plant gene flow dynamics and reproductive biology, economic valuation of pollination services, from literature, museum collections, existing databases.					

1.7b. Clean and verify data.					
1.7c. Develop effective interaction database (plant-pollinator-agroecosystem); in depth for target cropping systems, in outline for crops for which information is scarce.					
1.7d. Use database to flag gaps in knowledge, document gaps and publish a review of state of knowledge.					
1.8 Development of a decision-support system to integrate information on pollinator landscape management: Pollinator Information Management System.					
1.8a. Develop integrated information management system, integrating the bibliographic database, identification tools, and interaction databases developed through activities above, with a user interface. Modules to be first developed will include Organism modules, Interaction modules, the Descriptive database, the Expert database and the Bibliographic database.					
1.8b. Standardise terms to be used in descriptive database, and interaction terms					
1.8c. Populate with data, for each Study, Training, Evaluation and Promotion (STEP) site agroecosystem: Organism modules, Interaction modules, Descriptive database, Expert database and Bibliographic database.					
1.8d. Enable and verify the capacity of the integrated information system to provide responses with respect to a simplified set of management questions, for area and crop or pollinator specific queries, based on the Study, Training, Evaluation and Promotion (STEP) sites.					
1.8e. Make PIMS available in training opportunities in STEP sites, and modify the interface according to user feeback, including linkages to the Guide to Pollination Knowledge Management (activity 4.5)					
1.8f. Develop further modules for Pollination Information Management System, including Collection management tools and database (or link to GBIF portal), Weather service, Location module, Ecosystem module, GIS or topographic module.					
1.8g. Populate the additional modules with data, for those STEP sites where there is adequate information.)					
1.8h. Enable and verify the capacity of the integrated information system to provide responses with respect to a complex set of management questions, for area and crop or pollinator specific queries, based on the Study, Training, Evaluation and Promotion (STEP) sites.					
1.8i. Make the complete PIMS available in training opportunities in STEP sites, and modify the interface according to user feedback.					
1.8i. Convene a workshop of practioners and experts to review and verify the operation of the PIMS (and to develop a set of decision-tree rules).					
1.8j. Make PIMS available to a wider public, through a web portal					

Activities and time table by Outcome	**Project: "Conservation and Management of Pollinators for Sustainable Agriculture, Through an Ecosystem Approach"**				
Component 2. Promotion of Pollinator-friendly Best Management Practices	**Planning period:** September 2007 –August 2012		**ANNEX B**		
Activities Sub-activities	Timeframe Years				
	1	**2**	**3**	**4**	**5**
2.1 Develop in a participatory manner and implement Study, Training, Evaluation and Promotion (STEP) sites management plans					
2.1a. Develop protocols/common set of data to be gathered as inputs to management plans, including consultation with community *(begun in pdf phase)*					
2.1b. Collect data in STEP sites					
2.1c. Develop management plans, in a participatory manner, testing specific recommendations/interventions					
2.1d. Implement management plans with participatory approach (staff time, transport, labour costs, leasing costs, GIS technologies).					
2.2 Further survey of pollinator-friendly agricultural practices, including case studies					
2.2a. Define survey protocols					
2.2b. Continue to call for case studies of pollinator-friendly agricultural practices including traditional and community knowledge, with a particular emphasis on those used in the agroecosystems of STEP sites.					
2.2c. Develop and implement broader survey of potentially useful practices by means of questionnaire.					
2.2c. Compile pollinator-friendly agricultural practices and make available to project partners and the public.					
2.3 Evaluate experiences and draw lessons learned from deploying pollinator-friendly agricultural practices in STEP sites					
2.3a. Document costs, benefits, and non-monetary values of pollinator friendly agricultural practices tested in STEP sites.					
2.3b. Develop participatory methods of evaluation of practices and solicit feedback from community.					
2.3d. Carry out evaluations of effectiveness and ease of use of specific recommendations to conserve and manage wild pollinators, involving farmers, researchers and development professionals.					
2.4 Publish lessons learned in STEP sites					
2.4a. Document the evaluation of and success with STEP site management plans					
2.4b. Make results of evaluations available to project partners and the public in case study format.					
2.4c. Translate lessons learned into more general guidance to local farming communities					
2.5 Translate lessons learned into more general guidance to local farming communities.					
2.5a. Identify network of applied pollination experts, for systems other than targeted cropping systems addressed in STEP sites.					
2.5b. Circulate STEP findings to network and convene e-mail discussion on drawing generalized conclusions, applicable					

to other farming systems.						
2.5c. Commission papers to elaborate on common findings and generalized conclusions.						
2.5d. Convene authors workshop, to peer review papers.						
2.5e. Edit papers for technical publication, design, layout and publish.						

Activities and time table by Outcome	**Project: "Conservation and Management of Pollinators for Sustainable Agriculture, Through an Ecosystem Approach"**				
Component 3. Capacity building for Conservation and Management of Pollination Services	**Planning period:** September 2007 –August 2012		**ANNEX B**		
Activities Sub-activities	Timeframe Years				
	1	**2**	**3**	**4**	**5**
3.1 Elaborate, carry out further needs assessment					
3.1a. Develop modalities for assessing capacity building gaps (*begun in PDF period).*					
3.1b. Assess and prioritize capacity building gaps					
3.1c. Identify specific subject matters for which trainers will need training: economic assessment methods, plant pollination limitation detection, development of pro-pollinator policy, etc.					
3.2 Review, adapt and develop training material for target clients; make material available					
3.2a. Continue updating the global and national review of capacity building material and making it available (*begun in PDF period)* .					
3.2b. Identify existing material that can be built upon (*begun/completed in PDF period).*					
3.2c. Develop both basic and specialised manuals and training modules building on existing material.					
3.2d. Publish manuals on CD, including translation for material to be shared globally.					
3.3 Provide training to farmers and to multipliers (TOT) at different levels.					
3.3a. Organize, advertise and coordinate training of trainers on specialized topics, in STEP sites.					
3.3c. Organize, advertise and coordinate training for farming communities in STEP sites.					
3.3b. Evaluate effectiveness of training.					
3.4 Provide training in existing organizations					
3.4a. Identify opportunities for training in existing venues (environmental education centers, botanical gardens, yearly agricultural exhibitions, school clubs and gardens).					
3.4b. Organise, advertise and coordinate training in existing venues					
3.4c. Develop information material and activities for diverse receptive groups					
3.4d. Evaluate effectiveness of training					
3.5 Provide training at formal school level					
3.5a. Identify opportunities for introducing pollination into curriculum (*begun/completed in PDF period).*					
3.5b. Develop and prepare education material for inclusion in diverse curriculum/teaching material (different school levels, existing classes, field trip opportunities)					
3.5c. Develop collaborative research agreements with appropriate university personnel/technical schools to support research agendas in STEP sites.					

3.6 Provide training on taxonomic knowledge					
3.6a. Develop training material for parataxonomic training.					
3.6b. Organise, advertise and coordinate training in existing organizations/venues.					
3.6c. Evaluate effectiveness of training.					
3.7 Provide distance training					
3.7a. Identify opportunities to convert training material into aids for distance learning.					
3.7b. Identify venues for hosting distance learning .					
3.7c. Develop distance learning training courses.					
3.7d. Make distance training courses available and advertise.					
3.7e. Assist and guide distance learners.					
3.7f. Evaluate effectiveness of training.					
3.8 Develop roster of experts for capacity building, sharing of expertise					
3.8a. Identify areas of expertise needed in pollination services management and conservation, and experts in the relevant areas.					
3.8b. Develop terms of engagement for experts in a capacity building network, and determine the willingness of experts to contribute.					
3.8c. Develop roster of experts and interface for accessing through project web portal.					

Activities and time table by Outcome	**Project: "Conservation and Management of Pollinators for Sustainable Agriculture, Through an Ecosystem Approach"**	
Component 4. Public Awareness, Mainstreaming and Information-sharing	**Planning period:** September 2007 –August 2012	**ANNEX B**

Activities Sub-activities	Timeframe Years				
	1	**2**	**3**	**4**	**5**
4.1 Further Assess levels of public awareness					
4.1a. Develop a professional public awareness survey approach to gauging levels of public awareness, based on PDF experience, applicable in all partner countries					
4.1b. Disseminate public awareness survey approach to survey specialists in partner countries, through workshop					
4.1c. Carry out country assessments of public awareness, twice, at beginning and end of project					
4.2 Raise public awareness for pollinator conservation and sustainable use					
4.2a. Refine public awareness strategies with targets of multipliers (trainers, extensionists, teacher, farmer associations, consumer associations, policymakers, at national and global levels) (*begun in PDF period)*					
4.2b. Implement public awareness strategies					
4.3 Support development of national pro-pollinator policies					
4.3a. Refine analysis of enabling policy environments, on national level. Document and analyse new developments in policies, legislation, and economic instruments that impact on pollinator conservation and sustainable use. Review successes and failures in mainstreaming (*begun in PDF period).*					
4.3b. Organise, advertise and convene stakeholder meetings and field days on STEP sites.					
4.3c. Organise events to sensitise policy makers.					
4.3d. Commission draft national policy paper on pollination, including legislative and voluntary measures.					
4.3e. Convene national pollinator policy workshop.					
4.3f. Publish and publicise report of workshop.					
4.4 Support development of supra-national pro-pollinator policies					
4.4a. Refine analysis of enabling policy environments, on global level. Document and analyse new developments in policies, legislation, economic instruments and intergovernmental agreements that impact on pollinator conservation and sustainable use. Review successes and failures in mainstreaming (*begun in PDF period).*					
4.4b. Support the development of incentive programs and voluntary measures.					
4.5 Dissemination of information, including translations					
4.5a. Develop and produce Generalised Guide to Pollination Knowledge Management: Refine from project outputs suitable material to be disseminated globally, and target audiences (global consulation) , with a focus on a simplifed, easily-read guide to managing pollination services, making the best use of pollination knowledge, increasing awareness					

and understanding of the ecosystem approach in the process, drawing examples from STEP sites but showing how the lessons learnt are of wide applicability.					
4.5b. Identify effective means of dissemination.					
4.5c. Establish an information-sharing network of information generators and recipients.					
4.5c. Translate material as needed; in particular, translation of simplified guide and publication abstracts into French, Spanish and Arabic.					
4.5d. Publish and disseminate material.					
4.6 Maintenance of web portal					
4.6a. Identify content and functionality of webportals (*begun in PDF period with IT report).*					
4.6b. Establish commitments for sustainability of websites after project completion.					
4.6b. Develop webportals and link national portals with global.					
4.6c. Maintain and update webportals.					

Activities and time table by Outcome	**Project: "Conservation and Management of Pollinators for Sustainable Agriculture, Through an Ecosystem Approach"**				
Component 5. Project Management	**Planning period:** September 2007 –August 2012			**ANNEX B**	
Activities Sub-activities	Timeframe Years				
	1	**2**	**3**	**4**	**5**
5.1 Arrangements for overall project administration and implementation					
5.1a. Hire global project coordinator.					
5.1b. Hire project personnel in partner countries.					
5.1c. Establish and equip national project offices.					
5.1d. Establish national steering committees in each partner country.					
5.2 Establish and operate project reporting and accounting system.					
5.3 Prepare work plans for project personnel in partner countries.					
5.4 International Steering Committee Meetings					
5.5 National Steering Committee Meetings					
5.6 Project monitoring and evaluation					

ANNEX C: STAP ROSTER TECHNICAL REVIEW

"Conservation and management of Pollinators for Sustainable Agriculture through an Ecosystem Approach"

Summary and Recommendation.

This project addresses a group of organisms that has been sadly neglected by both biodiversity and agricultural scientists. Yet this group, the invertebrate and vertebrate pollinators, performs a function that is essential to the maintenance of the life cycle of a huge fraction of terrestrial plant species, including a great variety of arable, horticultural or plantation crops. The project seeks to increase awareness and knowledge of these organisms and the services they perform, improve methods for their study, investigate trends in pollinator populations under stress from agriculture, identify best management practices, establish guidelines for their conservation and management in agricultural landscapes and increase the capacities of a wide range of stakeholders.

This is an excellent project on a crucially important topic and should be funded by GEF at the level sought. The proposal is very well written with a wealth of information in the annexes, which already goes some way towards achieving one of its aims, that of collating the currently scattered sources of knowledge. The objective and proposed four outcomes are attainable. A number of areas where problems in project management or implementation may occurr are pointed out and some suggestions made for modification to the Brief to improve its clarity and the visibility of its stated aims. These are given in italics below.

Introduction and General Issues.

Whilst there is a significant minority of the world's plants that are wind or self pollinating the majority rely on the transfer of pollen by invertebrate or vertebrate animals The pollination function is thus one that is crucial to the completion of vegetational life cycles and thence to the maintenance of ecosystem integrity and the existence of *all* biodiversity in the majority of terrestrial ecosystems including a large variety of agro-ecosystems. It is this sector of biodiversity that is addressed in this proposal. Many agricultural practices have negative impacts on pollinators and pollination. The pollinators are a diverse group at the species level; the project has selected to focus on pollination systems in a range of tropical cropping systems which include many important vegetable and fruit crops. This serves the dual purposes both of carrying out work of global significance on a key component of world biodiversity whilst concentrating on a geographical sector which has been neglected in comparison with the temperate regions.

The objective given to the project is 'enhanced understanding, conservation and sustainable use of pollinators through an ecosystem approach in selected countries for sustainable agriculture' (para 72). Whilst this is certainly descriptive of the programme of work that is proposed it could be said that the previous sentence in the same paragraph ('the project seeks to harness the benefits of pollination services provided by wild biodiversity for the mutual benefit of human livelihoods and biodiversity conservation') is more expressive of the intentions and benefits which this project embraces.

The authors should give some thought to re-wording the project objective for greater impact.

The proposal lays out a programme of work targeted at four Outcomes (para 73).
Outcome 1. Expanded knowledge of pollination services for farmers, land managers and policy makers.
Outcome 2. Enhanced conservation and sustainable use of pollinators for sustainable agriculture.
Outcome 3. Increased capacity for conservation and sustainable use of pollinators by farmers and land managers.
Outcome 4. Mainstreaming of pollinator conservation and sustainable use.

These are later, and somewhat confusingly described, together with 'Project management', as the *five components* of the project (para 78).

This is an unnecessary elaboration. The Outcomes should stand alone as a group and Project Management be dealt with separately.

As detailed below further work should also be done to ensure that the Outcome statements adequately reflect the intentions and richness of the work programme they describe. Whilst this may seem simply a semantic issue the Outcome statements (as well as the objective referred to above) will be the first and perhaps the only description of the project that many will read and refer to. As presently worded these do not do the project justice.

Key issues

1. Scientific and technical soundness of the project
The scientific and technical issues are addressed in the first two of the Project Outcomes.

Outcome 1.
The work on the knowledge base is very well thought through and the sections of the Brief and the associated Annexes describing this component are well articulated, action-orientated and targeted at a series of clearly defined outputs.

The first of Output, a 'Pollination Bibliographic Database' will be a compendium of existing knowledge on pollinators, their ecology and the services they provide in agriculture (fully described in Annex I). This compilation will be greatly facilitated by a considerable body of work already done by project participants and advisers. It is to be expected that this will be an enormously valuable tool. Whilst there is a substantial body of information on pollination services in tropical agro-ecosystems this is very scattered, often inaccessible other than locally and much of it has not been subjected to quality assessment. This Bibliography will provide an invaluable base-tool for global work on the management of pollination as well as for the preparation of training materials.
Use of the bibliography will be facilitated by the associated development of a search tool based on the idea of a 'pollination thesaurus'.

Useful though this bibliography of current literature may be the main target of the project is to improve the knowledge base. This entails a variety of initiatives detailed under this Outcome and Outcome 2. But beyond improved data the project has taken on the ambitious task of attempting to provide an integrated framework for the study and management of this key functional group. Components of this framework include methods for assessing and monitoring trends in pollinator populations and services (Annexes J and K) which is crucial baseline of information on relationships between agricultural practices and pollination services against which any future actions must be judged; a network for taxonomic identification of pollinators bringing together international experts; a database on pollinator ecology which will provide important information on their significance both for management in agricultural systems and in the landscapes in which they are embedded; and methods for economic valuation of pollination services (Annex L). This last is ambitious but extremely important; experience shows how difficult it is to establish the importance of organisms or the functions they provide unless some kind of cash value can be attributed to them. The data and knowledge distilled from all the documentary research will be included in an international Pollination Management Information System.

This wealth of documentary outputs from the work under Outcome 1 should provide a synthesis of information knowledge and above all understanding of the biology of pollinators in tropical agricultural landscapes which will advance global capacity to manage, conserve and legislate for this key group of organisms.

The wording of this outcome does not adequately convey either the breadth or depth of the knowledge enhancement which it is intended to provide, and consideration should be give to re-wording the statement to emphasise issues of availability and access to knowledge as well as indicating that the stakeholder relevance is wider than farmers and land managers.

Outcome 2

A body of work is proposed to obtain new knowledge and insights into 'Good Agricultural Practices' with respect to the management of pollinators in order to reduce the negative effects of current practices and achieve impacts in terms of increased productivity which can be attributed to improved management of pollination services. The expected end-of -project impacts of this work are very clearly laid out in the Impact Statement in paragraph 80 and the authors are to be commended for their transparency in this respect. This work will largely be conducted at the demonstration sites that have been established in the seven participating countries. Detailed descriptions of the sites and of the criteria and steps used in their selection are given in Annex O, from which it is clear that this was a very thorough and participatory process.

Outcome 2 is thus targeted at using a combination of current scientific knowledge (the synthesis from Outcome 1) together with present realities of farm management to develop 'best practices' for pollinators and their services at an ecosystem scale. Unfortunately this key component of work is not as clearly described in the Brief as is that of Outcome 1. The authors state unequivocally in paragraph 94 that 'the actions that will need to be taken to conserve and manage pollinators are not completely known and will need to be developed in an adaptive manner'. This is thence a challenging but absolutely important

piece of work. The approach appears to centre round a 'survey of good agricultural practice' but little detail is given in the one paragraph (96) of the Brief devoted to this. There is also, despite the level of detailed information on the sites in Annexes O and G, a surprising lack of discussion of the potential (or indeed currently observed) relationships between the level of intensification in agricultural management in the various sites and the potential impact on the pollination services. There is however much detail in Annex K - including a list of potentially important practices (eg. closeness to wild habitat, availability of resources etc)and a list of questions which will provide a basis for this survey – and additional relevant material in Annex G, which indicates that these issues of both concept and methodology have been identified, discussed and planned for during the preparatory process.

The authors can improve the Brief by using in a summarised form some of the material from the Annexes to strengthen the paragraphs in the Brief so that a clearer view is given of both conceptual framework and the field activities that will be undertaken. The provision of one or a few hypotheses on the relationships between management practices and pollination services might also be undertaken.

2. Identification of the global environmental benefits

The crucial importance of the pollinators to the function of terrestrial ecosystems has already been emphasised in the opening paragraphs of this review. Yet this functional group, and its constituent species, has been largely ignored in biodiversity studies.

The project will serve the global community first of all by increasing awareness of the need to include study of pollinators and pollination services in biodiversity inventories and monitoring programmes. Beyond this it will provide documentary and methodological tools that will enable and enhance the monitoring and management of pollinators world-wide.

A basic principle of the project is that study of the biology of pollinators only makes sense at an ecosystem or landscape scale. This focus is entirely consistent with the principles and strategies of the CBD and GEF. More importantly it should lead to a better appreciation of the need to manage wild habitat in agricultural landscapes.

Improved appreciation of the importance of pollinators goes beyond inventory and documentation however. There are very substantial economic incentives for ensuring that pollination services are optimized in a wide range of arable, horticultural and plantation crops world-wide, as well as in the critical 'hot-spot' biodiversity centres that have been identified across the globe.

The fourth Outcome of the project addresses issues to do with the mainstreaming of knowledge and information on the management of pollinators as key components of global biodiversity ie: Outcome 4. Mainstreaming of pollinator conservation and sustainable use.

This wording is again inadequate; the intended outcome is surely that knowledge (and recommendations?) regarding pollinators and their services are mainstreamed with the

impact of improving conservation and sustainable management of this component of biodiversity?

3. Goals and operational strategies of GEF

The project is entirely consistent with the goals and operational priorities of GEF. At a specific level it clearly targets a key component of the diversity of Operational Programme 13, 'Conservation and sustainable use of biological diversity important to agriculture'. It responds very clearly to the strategic requirements of addressing both the intrinsic value of biodiversity and also the value of diversity in providing services to humanity. It addresses the impacts of human activities on biodiversity and its functions and it strongly promotes international cooperation in biodiversity actions.

The project goes beyond the scope of OP13 in that the principles and methods that will be developed will be applicable to 'natural' ecosystems world-wide, and in particular by drawing attention to the need to give better attention to the management of the invaluable resource constituted by the 'islands' of wild habitat in agricultural landscapes.

4. Global context.

The global context addressed in the project is all agricultural landscapes where cropping systems dependent on bio-pollination are located. Whilst this excludes the huge tracts in the northern hemisphere which are solely devoted to wind-pollinated grasses or sterile cereal crops it is nonetheless a truly global distribution. Indeed the issues addressed in the project further call into question the wisdom of biologically homogeneous landscapes typified by industrialized cereal production.

Bio-pollination is a crucial step in the maintenance of the majority of vegetation types in all terrestrial biomes, including a great variety of cropping systems. The first output of the project will ensure that the knowledge needed to manage and conserve pollinators is more widely available and accessible across the globe, particularly through the proposed Pollination Information Management System. The new knowledge to be generated on best management practices for pollination services will be derived from a range of sites across seven countries in the tropics. This will both serve to plug current gaps in the global datasets and also provide additional insights that should be globally applicable.

5. Replicability

A key feature of the project is the development, improvement and testing of methods for assessing the status of pollinators and their services and evaluating the impact of improved management. This should establish a methodological base that will be more easily replicated in future studies than is presently possible.

The criteria used for the selection and design of the demonstration (STEP) sites can serve as a useful guide to a wider range of benchmarks for monitoring pollination seervices.

6. Sustainability of the project

The outputs of the project have a value that will grow after the end of the project – those of improved datasets, new knowledge and understanding and improved capacity. The project is committed to putting into place the mechanisms to ensure the availability to all sectors of stakeholders. Nonetheless there is a risk of a less than maximum continuation

in impact unless these tools and notably the Pollination Information Management System are located with an agency that can ensure its continuity, updating and access. In the case of this project it appears that the participation of FAO should ensure this.
By the end of the project the STEP sites in the seven countries will constitute an invaluable 'field laboratory' not only for continuing work on pollination services, but because of their structure which includes links between agro-ecosystems and wild habitats, for study of other key landscape linkages such as nutrient and water cycles. The commitment of the both the host countries and the international community to maintain the sites should be made explicit.

Secondary issues

7. Linkages with other focal areas.
Changes in climatic patterns will undoubtedly affect pollinators as much as many other better studied organisms. A particular danger is that disjunctions may occur between the distributions of plant and that of their pollinators under climate change. The database on the ecology of pollinators and their interactions (Annex M) will be a start in building the potential for predicting some of these potential shifts but a great deal of additional work will be needed to make this at all rigorous.

Linkage with projects or institutions engaged in modeling vegetational shifts under global climate change to enable inclusion of risks from pollinator changes could be a valuable outcome of the project.

8. Linkages to other programmes and actions
The project has arisen out of a number of earlier inititiatives, notably the International Initiative for the Conservation and Sustainable Use of Pollinators (IPI). It is clear that during proposal development there has been substantial interaction with a large number of relevant collaborators as is laid out in great detail in the Brief in paragraphs 47 to 70 (pages 21 to 27) and Annex H. There is a considerable overlap of personnel in many cases.

The level of potential complexity in these interactions does however raise questions of how these interactions will be managed by the project. Demands from outside can become very high; the project management will need to develop clear policies on their response to such demands.

9. Other beneficial or damaging environmental effects
The practices which will benefit pollinators will also benefit other sectors of biodiversity and the functions and services they perform. For example the reduction of the use of pesticides, the promotion of integrated pest management practices and the inclusion of wild habitats in agricultural landscapes will also promote the health of the biodiversity below-ground and the nutrient cycles and other services they provide.

10. Involvement of stakeholders
The project embraces a diversity of stakeholders from the farmers and their families at the demonstration sites to the global biodiversity science and policy community.

Interactions with all these groups are described through out the Brief, and explicitly in paragraphs 131 to 136 (pages 44 and 45). Adequate consultation appears to have been carried out, and mechanisms (including the impressive capacity building programme) put in place for the inclusion of stakeholders in the decisions and actions of the project. Nonetheless the needs and demands of such a huge diversity of stakeholders are not easily maintained in a project of this complexity. The project management structure is well designed but will need to explicitly address on a continuous basis the issues of need to know and need for involvement. A knee-jerk principle of total inclusivity is easily embraced but ultimately unworkable.

11. Capacity-building

Capacity building is a major feature of the project as expressed in Outcome 3:
‘ Increased capacity for conservation and sustainable use of pollinators by farmers and land managers’ and documentary support is laid out in Annex P. The training covers a wide range of stakeholders from direct beneficiaries (farmers) to policy-makers and journalists, and also includes school children as future stakeholders. A component with particular global value is the development of a global network of identification specialists. As with many other components of biodiversity the status of pollinator taxonomy world-wide is totally inadequate to need and we continue to run the risk of losing species simply through failure to recognise them.

Once again the outcome statement does not do full justice to the breadth of the capacity building programme.

12. Innovativeness

This project is innovative in its very origins ie. that it addresses a neglected component of biodiversity. It is also innovative in taking an ecosystem and functional approach to the study of the organisms concerned.

Where innovation stops a bit short is in conceptualizing the threats to pollination services, and best practices to combat them – as already commented on in the report on Outcome 2 in Section 1. The authors should consider including some hypotheses on these aspects.

Professor M.J. Swift, MA, PhD on behalf of STAP

ANNEX C1. RESPONSE TO STAP TECHNICAL REVIEW

"Conservation and Management of Pollinator for Sustainable Agriculture through an Ecosystem Approach", a UNEP-GEF proposal

The partners contributing to this proposal thank the STAP reviewer for his thorough and productive review. Those comments in need of specific responses have been extracted from the review, with responses given beneath.

Introduction and General Issues.

A. Reviewer comment:
The authors should give some thought to re-wording the project objective for greater impact.
Response:
The suggestion that the attainable aims of the project may exceed our stated objectives is very much appreciated. The objective as stated does indeed focus on the process (enhanced understanding, conservation and use), while the suggested rewording focuses on the result (harnessing the benefits). We agree that project objectives should be impact and results-oriented, and have adopted the suggested change in paragraph 72 of the project brief, and in the statement of the immediate objective in the logframe and monitoring and evaluation plan.

B. Reviewer comment:
The Outcomes should stand alone as a group and Project Management be dealt with separately....As detailed below further work should also be done to ensure that the Outcome statements adequately reflect the intentions and richness of the work programme they describe. Whilst this may seem simply a semantic issue the Outcome statements (as well as the objective referred to above) will be the first and perhaps the only description of the project that many will read and refer to. As presently worded these do not do the project justice.

Response:
We have considered rewording of outcomes, and respond to each below. We also agree that Project Management should not be conceived or suggested of as an outcome, and we have addressed this by referring to the four outcomes, in paragraph 78 of the project brief, with project management mentioned as a fifth component separately from outcomes.

Key issues
5. Scientific and technical soundness of the project

C. Reviewer comment:
The wording of this outcome (1) does not adequately convey either the breadth or depth of the knowledge enhancement which it is intended to provide, and consideration should be give to re-wording the statement to emphasise issues of availability and access to knowledge as well as indicating that the stakeholder relevance is wider than farmers and land managers.

Response:
We agree that the strength of this Outcome and component of activities is in the integration and greater accessibility of knowledge, not merely in the accumulation of information. We want to be cautious, however, of listing too many stakeholders; the stakeholders addressed (farmers, land managers and policy makers) comprise key decision makers and managers of natural resources, and other relevant stakeholders, such as the research community who can contribute to the use and development of the framework, are implicitly included in the process. The outcome has been reworded, as "Integrated and accessible knowledge base for management of wild pollination services, for farmers, land managers and policy makers"

D. Reviewer comment:
The authors state unequivocally in paragraph 94 that 'the actions that will need to be taken to conserve and manage pollinators are not completely known and will need to be developed in an adaptive manner'. This is thence a challenging but absolutely important piece of work. The approach appears to centre round a 'survey of good agricultural practice' but little detail is given in the paragraph 96 of the Project Brief devoted to this.

(and)

E. Reviewer comment:
The authors can improve the Brief by using in a summarised form some of the material from the Annexes to strengthen the paragraphs in the Brief so that a clearer view is given of both conceptual framework and the field activities that will be undertaken. The provision of one or a few hypotheses on the relationships between management practices and pollination services might also be undertaken.

Response:
These are valuable points; we do not want to stress the uncertainty so much as the fact that there is little work in characterising the value of practices that benefit pollinators, and the project will address that gap. To do so effectively, a framework for assessing the value of practices to pollinators needs to be in place early on in the project, and a rigorous method of asking questions and comparing results needs to be followed. This framework and methodology is elaborated in the annexes, and we have brought this into the proposal text in a more cohesive manner. Paragraphs 94-96 have been modified to address this issue

6. Identification of the global environmental benefits
The fourth Outcome of the project addresses issues to do with the mainstreaming of knowledge and information on the management of pollinators as key components of global biodiversity ie: Outcome 4. Mainstreaming of pollinator conservation and sustainable use.

F. Reviewer comment:
This wording is again inadequate; the intended outcome is surely that knowledge (and recommendations?) regarding pollinators and their services are mainstreamed with the

impact of improving conservation and sustainable management of this component of biodiversity?

Response:
Indeed the phrasing of the outcome is a form of shorthand; it is awareness, policies and knowledge that are mainstreamed, for the benefit of pollinators, but we feel that this is implicit in the wording. Mainstreaming is defined as bringing an issue into the "prevailing current of thought, influence or activity" (Princeton WordNet). In that sense, it captures the need to move technical knowledge into the sphere of public awareness and policy.

7. Goals and operational strategies of GEF
(no responses needed)

8. Global context.
(no responses needed)

12. Replicability

G. Reviewer comment:
A key feature of the project is the development, improvement and testing of methods for assessing the status of pollinators and their services and evaluating the impact of improved management. This should establish a methodological base that will be more easily replicated in future studies than is presently possible.

Response:
We appreciate this reinforcement of the means by which pilot work in demonstration sites can lead to replicability, and have noted this in the section on Sustainability, Replicability and Risks, paragraph 120.

13. Sustainability of the project

H. Reviewer comment:
Nonetheless there is a risk of a less than maximum continuation in impact unless these tools and notably the Pollination Information Management System are located with an agency that can ensure its continuity, updating and access. In the case of this project it appears that the participation of FAO should ensure this.

Response: The commitment of FAO, as stated within the project document, to maintaining the knowledge base has been strengthened in a rewording of paragraph 129.

I. Reviewer comment:
By the end of the project the STEP sites in the seven countries will constitute an invaluable 'field laboratory' not only for continuing work on pollination services, but because of their structure which includes links between agro-ecosystems and wild habitats, for study of other key landscape linkages such as nutrient and water cycles. The commitment of the both the host countries and the international community to maintain the sites should be made explicit.

Response: We agree that adding other key landscape linkages to the investigations in demonstration sites will add considerable value. Discussion of research agendas in project sites have already included scope for interactions with other components, principly watershed and pest control aspects but others may enter as well. As country-driven projects with project activities on sites identified by national partners and stakeholders, the maintenance of sites will be the responsibility of host countries. Each country may address this differently (and the affordability of maintaining long term research structures may be differently perceived), but as noted in paragraph 46 the following commitments have been made in Ghana (agricultural extension and research institutions involved as partners in the project are committed to incorporating the research agendas adopted into their programs); in South Africa (an ecosystem services unit is being developed at SANBI, and this unit will be in a position to make sure that the outcomes of the pollination project continue to be mainstreamed into policy, as well as providing support for ongoing research on pollination); and in Pakistan (an outcome of the project will be to have pollination accepted as a means of attaining the objectives specified by the Government of Pakistan's agricultural policy. The project will be taken over by the Pakistan Agricultural Research Council under the Ministry of Food, Agriculture and Livestock (MINFAL) for recurrent funding to run the project after the expiry of the full-size project). Additionally, in Brazil, many demonstration sites will be managed by university researchers with long-term research agendas;

Secondary issues

14. Linkages with other focal areas.

I. Reviewer comment:
Linkage with projects or institutions engaged in modeling vegetational shifts under global climate change to enable inclusion of risks from pollinator changes could be a valuable outcome of the project.

Response:
Particularly in areas with abrupt topographical change where vegetational shifts due to climate change could be realised over relatively small areas (such as Kenya, Nepal, Pakistan and India), project partners have expressed an interest in including a focus on potential climate change impacts on pollination services. Some key interactions are noted in paragraphs 3 and 24. We agree with the suggestion that more formalised linkages with climate change researchers is warranted, and will be pursued in project implementation.

15. Linkages to other programmes and actions

J. Reviewer comment:
The level of potential complexity in these interactions does however raise questions of how these interactions will be managed by the project. Demands from outside can become very high; the project management will need to develop clear policies on their response to such demands.

Response:
The project as constituted is a contribution to the International Initiative for the Conservation and Sustainable Use of Pollinators (IPI); an initiative which has many stakeholders and participants. It is not intended that the project management unit would coordinate this initiative, and the unit can and should interact with other aspects of the IPI to the extent needed to fulfill and enhance project outcomes, but not beyond this. We appreciate the comment and will ask the International Steering Committee to elaborate more precise policies.

16. Other beneficial or damaging environmental effects

K. Reviewer comment:
The practices which will benefit pollinators will also benefit other sectors of biodiversity and the functions and services they perform. For example the reduction of the use of pesticides, the promotion of integrated pest management practices and the inclusion of wild habitats in agricultural landscapes will also promote the health of the biodiversity below-ground and the nutrient cycles and other services they provide.

Response:
We agree that stronger wording on the added value of interlinkages is warranted, and have added this in paragraph 83 of the project brief .

17. Involvement of stakeholders

L. Reviewer comment:
The project management structure is well designed but will need to explicitly address on a continuous basis the issues of need to know and need for involvement. A knee-jerk principle of total inclusivity is easily embraced but ultimately unworkable.

Response:
Advice well-taken. The specific roles and responsibilities of different bodies and ways of communications as indicated in the M&E plan will be further elaborated and made more concrete through the ToRs of these committees and bodies during the project appraisal phase

18. Capacity-building

M. Reviewer comment:
Once again the outcome statement does not do full justice to the breadth of the capacity building programme.

Response:
We do appreciate the comment that the actual attainments may exceed this stated outcome. However, it has been our concern that both for outcomes one and outcomes three, the general public is too large of a target audience; thus we have qualified the outcomes with a short list of a critical target audience. We agree that a larger interest group may well benefit and build capacity, but feel that we are limited in being able to monitor and evaluate a more broadly-stated outcome.

13. Innovativeness

N. Reviewer comment:
Where innovation stops a bit short is in conceptualizing the threats to pollination services, and best practices to combat them – as already commented on in the report on Outcome 2 in Section 1. The authors should consider including some hypotheses on these aspects.

Response:
We have done so, as discussed in the response to comment D and E above.

ANNEX C_2. WORLD BANK REVIEW

This project seeks to develop and disseminate methods for better conserving agricultural pollinators. It targets an often-neglected ecosystem function that is critical for much of the world's agriculture. According to the project documentation, global benefits accrue in three ways:

1) Conservation of globally significant pollinator diversity (some of the countries are centers of pollinator diversity).
2) Conservation of associated biodiversity providing resources to pollinators.
3) Development of good management practices for pollinators.

The focus on global benefits could be strengthened. Presumably the biodiversity mentioned in #2 is globally significant, but there is no mention of what biodiversity in particular is likely to benefit from taking an ecosystem approach to pollinator conservation in the participating countries.

Additionally, given the strong emphasis on learning in the project, and the fact that a major global benefit would be the results of #3 above, it may be appropriate to make this a BD-4 project and put more emphasis on global (as opposed to national) dissemination of learning, with a more focused and pro-active approach targeting areas of pollinator diversity, for example. This would help increase global benefits, especially for those areas where pollinators may not be globally significant, or where conserving them does not contribute to the conservation of globally significant associated biodiversity.

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ANNEX C3. RESPONSE TO WORLD BANK REVIEW

We thank the World Bank for their comments on strengthening the global benefit focus of this project. We would like to emphasise that this project focuses on the conservation of biodiversity both at the species level (diversity of pollinators and associated floral resources) and at the level of an ecosystem service. We have added some wording to the proposal on the benefits to be accrued in conservation of associated biodiversity, but continue to emphasise that it is the organisms but also the functions whose conservation will be enhanced globally by the uptake of project outcomes.

altered text: para 81 ". Global benefits of the project will be both to conserve pollinator species and their associated biodiversity in agroecosystems, but also their important ecosystem function contributing to agricultural yields and quality. "

In addition we have made a more explicit statement of global benefits in the Incremental Cost Analysis, Annex A, as:

Global benefits of the project are (a) the conservation of globally significant pollinator diversity; (b) the conservation of associated biodiversity providing resources to pollinators, including associated floral resources and vegetation providing nesting sites in representative agro-ecosystems; (c) the development and dissemination of practices to conserve and manage wild pollination services that can be used both within and outside the project countries; (d) development of an expanded knowledge base and network of expertise on management of pollination services, made accessible globally; (e) provision of information on status and trends of pollinators in representative agroecosystems made available to policymakers (f) development of tools to valuate the costs and benefits of pollination services to human livelihoods and (g) concrete demonstrations of the principle that ecosystem services such as pollination sustain both agriculture and biodiversity conservation, and (h) introduction of innovative practices and policies to incorporate conservation of pollinators in spatial planning.

And the following sentence in quotes added:

Additional global biodiversity benefits that will accrue through the application of this approach will include other crop-related biodiversity such as beneficial insects and soil organisms. Pro-pollinator systemsfocus on the benefit of additional aspects of biodiversity, such as floral associates of pollinators in addition to crops, and vegetation that provides nesting sites. "In a general sense, the practices to be identified and promoted through this project will conserve a greater diversity of species- in particular of plants, insects, and microfauna- in agricultural areas, recognising that such diversity is beneficial to the health and sustainability of production landscapes." In this sense, the conservation of wild biodiversity in cropping systems will be recognised for its value and conserved.

With reference to the project's applicability to BD-4, we agree that the project is relevant to this priority. Paragraph 62 has been altered to reflect this.

Re distance learning, tThe project as currently structured does stress global dissemination of learning, although we have increased an emphasis on the distance learning program, as an organising principle from the beginning in the development of curricular materials, so that lessons learned in one country are globally available.

To reflect this, we have changed para 108 with the sentences in quotes:

At project initiation, an overall course structure for distance learning in conservation and management of wild pollination services will be established. "The overall structure and design of an e-learning course will serve as an organising principle for the development of all curricular materials throughout the project. The Technical Advisory Group will, in its initial meeting, identify the scope, structure and relevant modules. Course modules appropriate for the initial training of trainers, developed with instructional designers, will be made available to the capacity building activities in all countries, and will be adapted as needed in each country. Course content will be enhanced based on project experiences in demonstration sites and other activities, to create a comprehensive distance learning course for both extension and university courses. Profiles of experiences in developing best practices in one country will be available to use as case studies for training in all other countries." This distance learning courses, including informational material, case studies, exercises and exams, will be developed and tested in pilot programs in at least two countries. The effectiveness of a distance learning program will be assessed in year four, and by the end of the project, arrangements will be in place for a sustainable host for the programme to take over its full management, making it available globally. Possible hosts for distance learning have been identified in the project development phase.

ANNEX D. LETTERS OF ENDORSEMENT

ANNEX D_1. CO-FINANCING COMMITMENT LETTERS