

## Progress Report

### SECTION1- BACKGROUND INFORMATION

*1.1 Project Title: People, Land Management and Environmental Change*

*1.2 Project Number: GF/1300-98-01*

*1.3 Responsible Office: The United Nations University*

*1.4 Co-operating/Executing Institutions: University of Ghana, Ghana; University of Conakry, Guinea; Kenya Agricultural Research Institute, Kenya; Ukiriguru Agricultural Research Institute, Tanzania; Makerere University, Uganda; Xishuangbanna Tropical Botanical Garden, China; National Research Institute, Papua New Guinea; IPAM (Instituto de Pesquisa Ambiental da Amazônia), Brazil.*

*1.5 Reporting Period: 1 March – 31 August 2001*

### SECTION 2 –PROJECT STATUS

*2.1 Status of the Implementation of the Activities and Outputs Listed under the Workplan in the Project Document*

*2.1.1 Status of the Implementation (check appropriate box)*

Project activities and outputs listed in the Workplan for the reporting period have been materially completed and the Institution reporting is satisfied that the project will be fully completed on time (given reasons for minor variations at Section 3 below)

Project activities and outputs listed in the Workplan for the reporting period have been altered (give reasons for alterations: lack of finance; lack of guideline; reformulated; project revisions; other at Section 3 below)

Project activities and outputs listed in the Workplan for the reporting period have not been fully completed and delays in project delivery are expected (give reasons for variations in Section 3.1 and new completion date in Section 3.2 below)

Insufficient detail provided in the Project Workplan

*2.1.2 Overall Progress Against the Project Workplan*

PLEC is in the final year of the present four-year phase under GEF support. The project began its third year of implementation on 1 March 2000, and will finish on schedule. Significant progress has been made towards achievement of project objectives. Demonstration of profitable and biodiversity-rich management systems, and networking and capacity building continued in 2001. Increasing emphasis has been given to consolidation and dissemination of project findings for winding up the present phase by February 2002. One of the major outputs is in development of an effective participatory methodology based on expert farmers for identifying and evaluating farmers' resources management and for organizing the dissemination of this knowledge to other farmers and stakeholders. The emerging methodology is consolidated in the forthcoming book "Cultivating Biodiversity:

the Understanding, Analysis and Use of Agrodiversity ". As the present phase ends next year, developing follow-up projects is underway.

At least one agrodiversity model at each of 21 established demonstration sites, and main technologies associated with these models are identified and being demonstrated and tested through various approaches relevant to local conditions. The main approach is to facilitate on-farm exchange sessions of "expert farmer to other stakeholders". Other stakeholders include not only farmers, but also extensionists, local officials, school teachers and children from within demonstration sites and outside. Secondly, local grass-root organizations such as farmers' groups and family schools are supported to promote agrodiversity. Many of them deposit some income made from diverse group activities for future expansion, and also seek outsiders' supports in addition to PLEC. They can be served as continuing vehicles to sustain PLEC activities after project completion. With increasing roles of farmers' groups, extensionists, and local officials in organizing demonstration, scientists are playing a supplementary role.

PLEC continued to enhance capacities of individual participants as well as local institutions. Increasing number of extensionists, students, junior researchers and officials received training 'on the job' in the PLEC methods. Some of them have finished their degree theses based on PLEC work. Demonstration on resource management benefits not only farmers but also school teachers, children, extensionists, researchers and officials. Training courses or leaflets on management of new crops or farm inputs were organized to equip farmers with wide options for solving production problems. Study tours were arranged for farmers to visit research institutes to and see relevance of scientific experiments, new varieties and agricultural inputs to their farming problems. Support for development of local institutional arrangements continued. New farmers' groups have formed at PLEC sites. Development of community accords for resource management continued.

PLEC national and regional networks in participating countries emerge from grass roots organizations to national and regional research centers. PLEC linkage and cooperation with other national and international projects continued to expand. New farmers' groups are formed and linked to other groups and institutions in Tanzania, Guinea and Uganda. A regional network of five groups each located in one of the major ecological regions of the Amazon floodplain between Peru and the Amazon estuary has been developed, bringing together researchers, extensionists and farmers working on management of agrodiversity at farm and landscape levels.

On international networking, the 5<sup>th</sup> Meeting of Management Group was organised. In collaboration with IPGRI (International Plan Genetic Resources Institute) and SCBD (Secretariat of Convention on Biological Diversity), the organization of the international symposium on "Managing Biodiversity in Agricultural Ecosystems" was successful.

Dissemination of project findings continued. Two PLEC associated books "Exploring Agrodiversity" and "Handbook for the Field Assessment of Land Degradation" were published.

*2.2 List Actual Project Personnel/Consultants engaged and Non-Expendable Equipment Purchased:*

See Appendix 1 for List of Project Personnel/Consultants.

See Appendix 2 for List of Non-Expendable Equipment.

### *2.3 List Actual Activities and Outputs Achieved in the Reporting Period*

#### 2.3.1 FIELD-BASED ACTIVITIES: DEMONSTRATION SITES, BIODIVERSITY ASSESSMENT, PARTICIPATORY RURAL APPRAISAL and OUTREACH AND EXPERIMENTAL WORK

Field-based activities continued. At established demonstration sites agrodiversity has been inventoried and monitored. Data has been compiled into working database at national levels and being aggregated into a meta-database at the project level. Agrodiversity models at the demonstration sites are being tested and promoted. In addition, a set of participatory methodologies based on expert farmers' demonstrations are being developed and consolidated.

##### Demonstration site

21 established demonstration sites remained active although there were some adjustments in the year of 2000. In addition to subsidiary sites, new sites for replication of PLEC experiences and approaches have been identified, especially in Tanzania and Brazil. Monitoring the main economic activities has started at the new sites in Brazil.

##### Agrodiversity assessment and database

Most clusters have aggregated necessary information from their working databases and submitted it to the PLEC Scientific and Technical Advisory Team (STAT) for inclusion in the meta-database. The meta-database, which will be for public access by the end of this project year will not contain information that might involve contentious issues on property rights of indigenous knowledge. With emphasis on data analysis and consolidation for the final reports, STAT has prepared and provided guidelines for quantitative analysis of agrodiversity to all clusters. Monitoring of agrodiversity changes continued throughout the remaining period.

##### Demonstration and outreach activities

At least one agrodiversity model at each of the 21 established demonstration sites, and main technologies associated with these models have been identified and are being demonstrated and tested through various approaches relevant to the different local conditions. The main approach is to facilitate on-farm informal exchange sessions by expert farmer to other stakeholders. Other stakeholders include not only farmers, but also extensionists, local officials, school teachers and children from within demonstration sites and outside. The on-farm informal exchange provides a field forum and seminar for fruitful discussion between expert farmers and other stakeholders on how to improve resource management. Participants learn from the expert farmers while expert farmers also benefit from rewarding discussion to further improve their technologies. Video sessions were organized to reach out a large number of farmers, who are unable to attend the on-farm discussion.

Secondly, PLEC continued to support local grass-root organizations such as various farmers' associations and family schools in organization of group activities that enhance agrodiversity, especially for better management and rehabilitation of common resources at village and inter-village levels. Farmers' groups are often organized on specific interests (such as poultry, home garden, bee-farming, et al) to facilitate collaboration, marketing, exchange of information and knowledge, and risk reduction of experimenting new ideas among group members. Group-based activities also tend to bring benefits to the community as a whole and could avoid ill feelings between selected and unselected farmers, which might arise in the case of informal on-farm demonstration in some demonstration sites. The group-based activities are particularly relevant to local context at PNG demonstration sites.

Many of these grass-root groups have successfully made income from group activities and deposited some income for future expansion, and also started seeking outsiders' supports in addition to PLEC. Farmers' groups in Uganda sites tried to solicit funds from various donors, including GEF Small Grants Program. The PLEC farmers' groups in Ghana received support for bee-keeping from Heifer International Project. These local organizations can be served as continuing vehicles to sustain PLEC activities after project completion.

With increasing roles and capacities of farmers' groups, extensionists, and local officials in demonstration, scientists are playing a supplementary role only. In Tanzania sites, involvement of scientists in facilitating discussions is currently less than 40% while that of extension staff has increased to more than 80%. In southern Ghana sites, farmers' groups are organizing some demonstration activities independent of scientists. On-farm community workshops were organized in China and Uganda to evaluate demonstration activities. Some of expert farmers in China were awarded for their excellent demonstrations.

The field-based assessment and promotion of agrodiversity have brought about not only agrodiversity enhancement at the demonstration sites, but also an effective participatory methodology based on expert farmers' experiences in identification and evaluation of best practices and in dissemination of this knowledge to other farmers and stakeholders. These findings have been consolidated in the forthcoming PLEC publication "Cultivating Biodiversity-the understanding, analysis and use of agrodiversity".

### 2.3.2 ACTIVITY 5: REPORTS, WORKSHOPS ON MODELS

As explained in the last report, there are some delay in completion of heavy reporting programme. The issue was discussed in the Arusha meeting of Management Group. Practical guidelines for data analysis and final reports were supplied to clusters after the meeting. Scientific coordinators and STAT members provided clusters with "Guidelines for the Final Reports" and "Quantitative Methods for the Analysis of Agrodiversity". As explained in the last report, integration and simplification of some chapter-lengthen reports is expected so that final synthesis reports can be finished in time.

Construction of a project meta-database is in progress and will be tested and put online by the end of this project year.

## 2.2.6 ACTIVITY 6: CAPACITY STRENGTHENING (TRAINING)

PLEC continued to enhance capacities of individual participants as well as local institutions. Increasing number of extensionists, students, junior researchers and officials received training 'on the job' in the PLEC methods. Some of them have finished their degree theses based on PLEC work. Demonstration on resource management benefits not only farmers but also, school teachers, children, extensionists, researchers and officials. Training of agricultural researchers and extensionists continued with the objective of increasing the understanding and appreciation for small holder production systems and research methodologies such as the expert farmers-based approach.

The following table lists number of students still working with PLEC in Brazil, China, PNG, Uganda, Ghana and Guinea. Search for funding continued for Center for Development of Artisan Fisheries at Santarém, Brazil on the integrated management of floodplain natural resources. Search also continued for the envisaged University of Ghana-based Centre for Applied Research on People, Land Management and Environmental Change.

	# Students finished their theses			# Students started their theses		
	Undergraduate	Masters	PhD	Undergraduate	Masters	PhD
Brazil	10	3	3	5	4	2
China		2			4	
PNG	4			2		
Uganda		1		6	4	1
Ghana					8	
Guinea					3	

Amazonia Cluster's Environmental Education Programme continued to train school teachers in two municipal school districts. The Environmental Education team and 30 schoolteachers held a workshop in environmental education, which was attended by some 2000 people. The programme's text: "Fazendo Educação Ambiental: O Mundo da Várzea" was published and was presented during Earth Week.

Support for development of local institutional arrangements continued. New farmers' groups have formed at PLEC sites, especially in Tanzania, Uganda and Guinea. Farmers' groups in Uganda sites were facilitated for registration and soliciting funds from various donors. One member from the Vice President's office of Tanzania participated in trees planting organized by the farmers' group and strongly encouraged farmers' efforts. Whatever farmers learn during group activities are shared between wife and husband at home in order to ensure that agrodiversity practices become an effort of the family.

Development of community accords for resource management continued. Many community meetings were facilitated to develop community accords for management of common resources at Ituqui sites in Brazil. Buffalo accords were consolidated as legal documents which stipulate the rights and responsibilities of ranchers and farmers with regard to the control of cattle and water buffalo on common lands of the community. This process is

similar to that of fishing accords that provide a basic framework for managing floodplain biodiversity.

Locally developed knowledge as well as germplasm continued to be diffused and promoted through expert farmers –based demonstration activities. The demonstration in Pita, Guinea diffused techniques of compost making. New farmers' groups were formed to accommodate the popular demand for the techniques. Training courses and production of leaflets on management of new crops or farm inputs were organized to equip farmers with wide options for solving production problems. Study tours were arranged for farmers to visit research institutes and see relevance of scientific experiments, new varieties and agricultural inputs to their farming problems. Participating farmers requested for more of such study tours as they were found to be very educative and answering several of the problems farmers face in daily life. These farmers also requested the scientists not to stay at the research stations but visit farmers and learn from each others. Participating farmers in Guinea received training in yam production.

#### 2.2.7 ACTIVITY 7: NETWORKING AND DISSEMINATION

PLEC national and regional networks in participating countries emerge from grass roots organizations to national and regional research centres. PLEC linkage and cooperation with other national and international projects continued to expand. Work of PLEC-Tanzania is integrated within extension services of the ministries of agriculture, forestry, community development and other sister projects like Traditional Irrigation Project (TIP) and Soil Conservation and Agroforestry Project Arumeru (SCAPA).

A regional network of five groups each located in one of the major ecological regions of the Amazon floodplain between Peru and the Amazon estuary of Brazil has been developed, bringing together researchers, extensionists and farmers working on management of agrobiodiversity at farm and landscape levels. This network has facilitated horizontal exchange among researchers, extensionists and farmers at the different sites and contributed to the development of management strategies and production systems adapted to the distinctive ecological conditions of each region.

Two core members of PLEC-Uganda participated in TSBF regional workshop in Arusha and have since then participated in developing research proposals on managing soil biota for improved agricultural productivity and integrating indigenous and scientific knowledge on Agrobiodiversity. PLEC has also strengthened cooperation with IPGRI and SCBD through joint organization of Symposium on Managing Biodiversity in Agricultural Ecosystems in Montreal, Canada, November 8-10, 2001.

The 5<sup>th</sup> meeting of Management Group was organized in Arusha, Tanzania, 2-6 May 2001. The meeting focused on important topics for successful conclusion of the present GEF phase and development of a new PLEC. Plans were made on completion of final reports, dissemination of PLEC findings through publications, national and international meetings.

Three regional meetings of PLEC in West Africa, East Africa and the Amazon regions are being organised and will further strengthen and expand existing regional networks.

### Presentations of project findings

- Contribution to the CBD synthesis paper on On-Farm Management of Crop Genetic Diversity and the CBD's Programme of Work on Agricultural Biodiversity, April 2001
- Two papers from PLEC-Uganda presented at TSBF regional workshop in Arusha early May.
- PLEC in Brazil, Tanzania, and Uganda were selected for GEF Second Study of Overall Performance (OPS2), May 2001.
- PLEC case studies from China and Peru were presented at UNESCO-sponsored International Conference on Biodiversity & Society, New York, 22-25 May 2001.
- Two case studies of PLEC-Ghana by E. Gyasi, et al, and that of PLEC-China by A. Chen et al, and the review paper 'Biodiversity at the landscape level' by H. Brookfield contributed to the GEF Biodiversity Planning Support Programme (BPSP) through Environment Liaison Center International (ELCI), May-August, 2001

### Major project associated publications:

- M. Brookfield and H. Brookfield, ed.. PLEC News and Views, No. 18, November 2001.
- H. Brookfield, 2001. *Exploring Agrodiversity*, New York, Columbia University Press.
- H. Brookfield, et al. *Cultivating Biodiversity: the Understanding, Analysis and Use of Agrodiversity*. In press.
- M. Stocking and N. Murnaghan, 2001. *Handbook for the Field Assessment of Land Degradation*, London, Earthscan Publications.

As for dissemination of PLEC findings by participating countries, see Appendix 3.

## 2.2.8 ACTIVITY 8: COORDINATION AND PLANNING

Coordination was focused on dissemination of PLEC findings, provision of guidance to clusters in completion of final reports, organization of the 5<sup>th</sup> meeting of Management Group, and the international symposium on Managing Biodiversity in Agricultural Ecosystems, and development of follow-up projects.

Scientific coordinators continued writing and editing the forthcoming PLEC book "*Cultivating Biodiversity: the Understanding, Analysis and Use of Agrodiversity*" and contributed to the CBD synthesis paper on On-Farm Management of Crop Genetic Diversity and Environment Liaison Centre International (ELCI) project on Managing Agricultural Resources for Biodiversity Conservation under the GEF/BPSP. Major efforts were made in organization of the international symposium on Managing Biodiversity in Agricultural Ecosystems with IPGRI and SCBD. Two scientific coordinators are on the programme committee. The managing coordinator serves as the symposium secretary. Development of follow-up projects to the present phase is underway. UNU will continue its support for the

PLEC networking after the completion of the present phase, and a UNU project proposal for 2002-2003 has been submitted.

### *2.3 Targets for the Next year*

Overall targets for the next period of work in relation to the annual work plan and outcomes of the previous period of work are described under each of 8 activities.

#### Activity 1: Demonstration sites

Continue work at established sites, and expand to nearby places as appropriate and as per demand.

Using field and GIS methods as appropriate complete investigation of potential sites in which PLEC methodology might be replicated. Report separately on potential sites for replication of PLEC approaches (Report 10), but in any case include discussion in the final report 12 described below.

#### Activity 2- biodiversity, agrodiversity and agro-biodiversity

Complete any gaps, including follow-up monitoring of selected sites, and entering of data in the standardized database form at cluster level.

Complete a project-wide meta-database and put it online as soon as most clusters submit aggregated information by end of 2001.

#### Activity 3: Participatory rural appraisal (organizational aspects)

Complete any remaining gaps in work on the social analysis of demonstration-site populations. Ensure that aspects in the Guidelines (including gender roles and resource tenure) are covered in a comparable manner for all sites.

#### Activity 4: Outreach and experimental work

Continue and expand monitoring and experimental work already initiated, in collaboration with selected expert farmers.

Hold community-level workshops to review results. Involve other stakeholders and officials at discretion. Review in collaboration with farmers the benefits they have received from PLEC, and benefits they might like to receive in any follow-up work. Report on this should be included in progress report to UNU, and be discussed in the final report (below).

#### Activity 5: Data analysis, reports, workshops on models

Clusters are to 1) undertake data analysis to test the PLEC-wide proposition that biodiversity is positively correlated with good management; 2) supply as soon as possible any delayed chapter-length reports; 3) organize a national meeting with officials from collaborating government agencies, NGOs and other organizations, at which the final technical and policy recommendations are presented and discussed. These recommendations should be formally



written up for national use, and sent to UNU as soon as available before end of February 2002 (Report 9).

Well in advance, clusters should also begin work on a final general report described below (Report 12). Following scientific coordinators' guidelines, the final report should (with or without its annexes) should be delivered by not later than 28 February 2002.

Cluster reports will be then consolidated as final reports of PLEC by the coordination team with STAT assistance.

#### Activity 6: Capacity strengthening (training)

Continue established capacity building programme, especially, graduate student training in PLEC work.

Attach a final summary statement on progress in the capacity building programme, with quantitative data on number, status and gender of persons trained, to the end-of-year report in February 2002. Attach this as a separate report (Report 11).

#### Activity 7: Networking and Dissemination

Meetings of international and regional significance in the second half year:

- The Sixth Regional Workshop of PLEC-West Africa: MANAGING AGRODIVERSITY FOR FOOD SECURITY AND IMPROVED RURAL LIVELIHOODS, Accra, 9-12 October 2001. Participants from government, academia, farmers' groups and donors in Ghana and Guinea came together to review Policy Implications and Futures of UNU/PLEC Work in West Africa, and will be reported in the final report.
- International Symposium on Managing Biodiversity in Agricultural Systems, Montreal, Canada, 8-10 November. The summary report of the symposium is now available on <http://www.iisd.ca/linkages/sd/mbae/>.
- 26-28 November 2001, Arusha, Tanzania. Regional meeting for East Africa Cluster- "Agrodiversity: lessons from PLEC in East Africa and directions for the future". The meeting will review project findings and recommendations and discuss a new project of PLEC in East Africa.
- 4-7 December, 2001, Universidade Federal de Para, Belem, Brazil. The First National Forum on Agrodiversity and Agrobiodiversity of Varzea. The forum will review project findings and policy recommendations, and discuss a new project of PLEC in Peruvian and Brazilian Amazon region.
- 23-27 April, 2002, New York, USA. The Fourth General Meeting of PLEC. The meeting will aim to summarize, present and exchange PLEC results, including technical and policy recommendations, and discuss a new phase of PLEC.

There were two presentations at international meetings:

- PLEC-Tanzania poster was presented at international workshop on Incentive Measures to Enhance Sustainable use and Conservation of Agrobiodiversity, organized by SADC Plant Genetic Resources Centre in Lusaka Zambia, 11-14 September, 2001.
- PLEC was presented at UNEP/GEF side event on 9 October during Conference of Parties (COP5) of the Convention to Combat Desertification (CCD).

PLEC book "Cultivating Biodiversity-the understanding, analysis and use of agrobiodiversity" is in press. The final report will be compiled for possible publication.

Every cluster will organize a national meeting separately, or in conjunction with a cluster meeting at which the final technical and policy recommendations will be presented and discussed with relevant government agencies, NGOs and academic institutions.

#### Activity 8: Coordination

Coordinators will meet in Montreal while participating the UNU/IPGRI/SCBD symposium. Final external evaluation of PLEC (to be organised by UNEP) will be facilitated. Development of follow-up projects will continue.

Clusters will organise national policy meetings and develop national or regional projects to follow up the present phase of GEF project.

### **SECTION 3 – PROJECT DELIVERY AND ACTION**

#### *3.1 Summary of the Problems Encountered in Project Delivery (if any)*

A general problem is the heavy programme of reporting as explained in the last report.

#### *3.2 Actions taken or required to solve the Problems (identified in Section 3.1 above)*

Clusters have been reminded to adjust their work priority and concentrate time from November 2001 on final reporting. Scientific coordinators and STAT members have provided clusters with "Guidelines for the Final Reports" and "Quantitative Methods for the Analysis of Agrobiodiversity". Since demonstration activities continue, and reporting programme is heavy, some extension of reporting schedule may be necessary in order to allow proper coordination and consolidation of diverse national reports of varied quality.

Attachment:

Appendix 1: Project Personnel/ Consultants, March 2001-February 2002

Appendix 2: List of equipment (as of 31 August 2001)

Appendix 3: Major meetings, Publications and Public Information, March-August 2001

## SECTION 4 – COUNTRY PROGRESS SUMMARY

### Amazon Cluster

The Amazon Cluster of PLEC has significantly progressed in developing a management system based on cabloco (decedents of indigenous and immigrant Amazonians) knowledge, which reflects the distinctive ecological conditions of the floodplain agroecosystems in Peru and Brazil. As a major accomplishment AMAPLEC has integrated these approaches into the formal institutional framework for agronomic research and extension by developing a network of five groups each representing one of the major ecological regions of the Amazonian floodplain. This network has alleviated the dissemination of results among farmers and scientists and contributed to the evolvement of management strategies and production systems adapted to the specific ecological conditions of each region. A second major achievement is the development of an effective participatory methodology based on expert farmers for identifying and evaluating of cabloco agricultural practices as well as for distributing their knowledge to other farmers. AMAPLEC has accomplished a third major objective by strengthen the close collaboration with formal research and extension programmes for rural development in order a) to improve the recognition of cabloco knowledge as key towards a sustainable development of the varzea and the conservation of biodiversity, b) to support research and extension methodologies and c) to promote exchange of knowledge between farmers, extensionists and scientists. The development of buffalo accords as legal documents to control water buffalo and cattle activities on community owned land is an excellent step towards the sustainable management and use of the floodplains.

Local capacity building activities have been vitally promoted by three main meetings held in Iquitos, Ipixuna and Macapa and the development of an Environmental Education Programme.

#### 1. Field-based Activities

The fieldwork carried out by AMAPLEC focused on further investigation of local cabloco knowledge, the promotion of local farmers groups and the assessment of bio- and agrodiversity. The expert farmer and farmer-to-farmer approach at different study sites as well as between sites has been expanded in order to gather and distribute valuable information on cabloco farming strategies.

AMAPLEC research has continuously investigated the species composition of grassland and forests as well as soil physical properties. Additionally, baseline studies on agroforestry systems and açai management are being processed. Substantial data have been collected in order to evaluate the movement and feeding patterns of cattle and water buffalo as well as their impact on the biodiversity of the floodplains. For this purpose, forage preferences, herd activities, changes in hydrological patterns, the composition of grasslands, forest stands and their structure are being analysed. The studies clearly demonstrate that livestock significantly altered the structure and composition of the forests and soil physical properties. Heavy livestock activities reduced the number and diversity of plant species as well as the soil bulk density and percent water content. However, the results suggest that flood pulse has a recuperating effect on soils compacted by livestock

The fieldwork on economic household activities has been concluded at all three sites and the analysis of the data is being carried out. Furthermore, investigations of main economic activities such as fishing, farming and cattle raising have started with three communities of the Tapara region in the Santarem area.

The experimental work and monitoring of farmers production and management techniques were continued. The studies show that less than a third of the 76 farmers involved in the investigation had to cope with decreasing yields. Given the difficult agricultural conditions such as high water levels in the low water season and excessive rains this is a reasonable result.

Selected farmers participated in seed banks to generate funds for acquisition agricultural inputs. Supplementary income earning activities, i.e. cheese production, community vegetable gardening and shrimp fishing, are being developed.

Regarding future PLEC activities, a major proposal for funding for the Center for Development of Artisanal Fisheries was submitted to the Pro Varzea Programme.

## 2. Reports, Workshops on Models

Outcomes of the demonstration activities, further development of technical advises as well as specific policy recommendations to national government and local officials are being developed for the three main study regions.

## 3. Capacity Strengthening

Capacity building continued through advising graduate and undergraduate students and training courses in environmental education. Two graduate students of the NAEA Doctoral Programme were directly involved in PLEC activities. Initiated discussions with the Faculdade de Ciencias Agrarias do Para (FCAP) on the collaboration with Instituto de Pesquisa Ambiental da Amazonia (IPAM) and the Center for Development of Artisanal Fisheries at Santarem highlighted opportunities to influence the training of agricultural researchers and extensionists with the objective of increasing the understanding and appreciation for small holder production systems and research methodologies such as the expert farmers approach.

Training courses on açai management, care of medicinal plants and environmental education were held in the two Marajo communities. The Environmental Education Programme trained schoolteachers in two municipal school districts and will begin in two new districts. A three-day workshop during Earth Week in June gave excellent opportunities for discussions between local farmers, students, teachers, stakeholders and the Environmental Education Team. Finally, the programmes text Fazenda Educaçao Ambiental: O mundo da Varzea was published and presented during Earth Week.

A further important development of the last half a year is the consolidation of buffalo accords as legal documents. They stipulate the rights and responsibilities of ranchers and farmers regarding the control of water buffalo and cattle on community owned lands. This process provides a basic framework for managing floodplain biodiversity as the studies on the vegetation and soils emphasize the negative impact of livestock on the natural resources.

## 4. Networking and Dissemination

A network of five groups each located in one of the major ecological regions of the Amazon floodplain has been developed bringing together researchers, extensionists and farmers working with caboclo management of agrobiodiversity at farm and landscape levels. This network has facilitated the horizontal exchange among researchers, extensionists and farmers and contributed to the development of management strategies and production systems adapted to the distinctive ecological conditions of each region.

Regular meetings were held with community organizations involved in the participatory management of floodplain resources as well as a general Cluster Meeting. They provided important opportunities to enhance the appreciation of the specific caboclo land use systems and supported an increasing collaboration of small holders with government officials, Union extensionists as well as researchers.

## 5. Outlook

Regarding future PLEC activities, a major proposal for funding for the Center for Development of Artisanal Fisheries has been submitted to the Pro Varzea Programme. Additionally, AMAPLEC has been selected as a successful example in the recent GEF evaluation which increases the prospect of ongoing activities.

## China Cluster

During this period, China Cluster placed its focus on agrodiversity survey, data analysis and report writing. At demonstration sites in Xishuangbanna and Gaoligongshan, expert farmers continued practicing demonstration activities and some of them were specially rewarded for excellence. Exchange of experiences between farmers has been facilitated through workshops organized by Farmer Associations. Capacity strengthening was enhanced through participation of graduate students and through training workshops for farmers. Dissemination of PLEC activities were promoted through distribution of two newsletters to relevant researchers and government officials.

#### 1. Demonstration Site

Twenty-seven expert demonstration farmers and one hundred and five experimentation farmers were continuing active in the three demonstration sites.

In Xishuangbanna, seventeen expert farmers continued working at two demonstration sites (Daka and Baka) with emphasis on home garden and agroforestation. In Gaoligongshan, ten expert farmers continued practicing demonstration of home garden, agroforestry, fuelwood and silviculture at Baihualing village. The Farmers Association on Biodiversity Conservation of Gaoligongshan organized a community workshop for exchanging experiences between twenty demonstration and non-demonstration farmers, with participation of local officials and project researchers. The Farmer Association rewarded those expert farmers who demonstrated excellent performances during year 2000.

#### 2. Biodiversity Assessment

Fifty-one sampling plots in four demonstration sites were selected for agrobiodiversity assessment in accordance with UNU/PLEC BAG guidelines and Household Agrobiodiversity Assessment (HH/ABA) methods. Some of the field data collected during 2000 has been integrated into PLEC standardized database.

In Xishuangbanna, field activities were conducted with focuses on three-years fallow, paddy and fuel woodlots. Also, survey was conducted on wild vegetables at local market and green fence system. Research and collection of upland rice varieties conducted, and two graduate students participated in the activity for their thesis.

In Gaoligongshan, thirty-four sampling plots have been surveyed among demonstration and non-demonstration farmers. Seventeen sampling plots of community forest were surveyed according to HH/ABA. Two graduate students were involved in the community forest management and agrobiodiversity on agricultural land respectively.

#### 3. Participatory Rural Appraisal

Reports on socio-economic analysis were prepared based on the field data collected during 2000. Field survey of household will be conducted in the next half year after crops are harvested.

#### 4. Outreach and experimental work

Monitoring survey on the demonstration and non-demonstration farmers continued by PLEC researchers. In particular, demonstrations of home garden and agrofoestation were focused for practicing agriculture with conversation in mind.

In Xishuangbanna, wild vegetables, wild fruits and some cash crops were introduced for the farmers' management of home garden system with conservation of wild-semi domesticated species.

In Gaoligongshan, farmers practiced demonstration of home garden, woody cash crops, agroforestry, fruit tree grafting, cash crop seedling and timber tree plantation. One on-farm community workshop was organized among fifteen farmers with participation of PLEC researchers, local officials and non-expert farmers. In the workshop, the expert farmers' demonstration activities were evaluated and some of them rewarded for excellence.

#### 5. Report, workshop on models

Eleven reports are under preparation by seven cluster members. For the purpose of discussing and clarifying outlines of the reports, the China Cluster organized a workshop on report writing in Kunming, 20-22 August 2001, for the seven cluster member.

#### 6. Capacity strengthening

Total six master degree students have been participating in PLEC China. Two of them, who joined PLEC in 1998, have passed their graduation thesis, and three of them continued field work and completed one paper. A new graduate student joined PLEC in order to carry out research on conservation of upland rice diversity.

For demonstration and non-demonstration farmers, a training workshop on “home garden modification” was organized in Xishuangbanna, June 2001, with participation of ten farmers. In Gaoligongshan, the Farmer Association organized one workshop for demonstration farmers, with participation of ten expert farmers, five non-expert farmers, project researchers, local officials and village head. Another community on-farm workshop was organized among demo and non-demo farmers with attendance of twenty farmers. The Farmer Association welcomed visitors at five occasions during this period.

#### 7. Networking and dissemination

For dissemination and communication, two issues of the China Cluster Newsletter were distributed among cluster members, government officials and other stakeholders.

Two members attended the UNESCO-Columbia Conference on “Biodiversity and Society”, 19-27 May 2001, and delivered an oral presentation on “Socio-economic development, land use and biodiversity change of Xishuangbanna”.

#### 8. Coordination and planning

The central office of the China Cluster in Kunming Branch of Xishuangbanna Tropical Botanical Garden (XTBG) maintained close communication with cluster members, the UNU/PLEC scientific coordinators and the managing coordinator.

A Working Group Meeting of the China Cluster was held in Kunming, 7-9 June 2001, to discuss work plan and budget for Year Four. Work plans for the next half period include completion of following reports and activities: eleven cluster reports required in the contract with UNU; socio-economic field survey; editing and publishing another special issue on *Acta Botanica Yunnanica*; analysis of data collected during 1998-2000 and data base entering; and other required works listed in the contract with UNU for Year Four.

### PNG Cluster

The Papua New Guinea Cluster of PLEC has completed the database on bio- as well as agro-diversity assessment. Furthermore, continued demonstration activities on farming practices and a field day has significantly supported the distribution of appropriate production and management techniques.

#### 1. Field based Activities

At both sites, Ogotana and Tumam/Nghambole, the data on bio- and agroddiversity in fallows, coffee and cacao gardens were completely analyzed and are being transferred into the PLEC Access database. Demonstrations on grassland rehabilitation, fallow management and biodiverse gardening have been continued. Furthermore, surveys on management practices, nutrition patterns, market settings and hunting activities were completed. The genealogical database was linked to the 1996 census of the Institute of Medical Research, containing furthermore group affiliations that relate to land ownership and land use.

Fostering a valuable use of the project findings, a map of the Tumam/Nghambole area was geo-referenced; place names and garden locations are being plotted at present.

#### 2. Reports and Workshops on Models

The Cluster presented four papers and one progress report. They covered important issues such as the value of biodiversity conservation, the sustainability of shifting cultivation systems, sustainable resource management and food production.

#### Papers

- Demonstrating the value of biodiversity conservation in Papua New Guinea.
- Sustainability of shifting cultivation systems and sago production.
- Planning for sustainable resource management.
- Sustainable resource management and food security.

#### 3. Capacity Strengthening, Networking and Dissemination

Relations with the Ogotana community, national NGOs and stakeholders have been maintained at a high level. A field day and a Cluster meeting held in July 2001 at Ogotana site have further strengthened the close collaboration between authorities and farmers. The field day embracing 43 participants from national as well as regional authorities and representatives from industry, villages and media as well as farmers received a considerable feedback.

#### 4. Outlook

As target for the upcoming period, the Cluster is going to finalize data recordings and analysis regarding the relationship between population growth, land tenure, economic settings, social organization and bio- as well as agrodiversity. The results will be disseminated through reports, information pamphlets and posters.

Two undergraduate students from the Department of Agriculture in the University of Technology will be engaged in ongoing research.

#### Tanzania Cluster

The Tanzania Cluster has substantially improved the involvement of local farmers, organizations, extensionists and officials as well as the dissemination of appropriated management strategies, the upgrade of training activities as well as the promotion of networking with the national government and related projects on natural resource management.

Best practices have been shared through six farmer-to-farmer sessions involving over 300 participants, with increasing numbers in extensionists and decreasing figures of scientists. The exchange also involved video presentations from previous sessions in order to ensure a wide dissemination of knowledge. Moreover, leaflets and booklets on locally adapted management of coffee, beans, round potatoes and organic inputs were distributed to the farmers.

#### 1. Field based Activities

The field-based activities of PLEC Tanzania have mainly focused on the involvement of farmers and other stakeholders in order to enhance agrodiversity, restore degraded areas and generate further sources of income.

During six on-site farmer-to-farmer sessions important topics were discussed including raising of tree seedlings, supplementary income sources from seedling sales, in-situ conservation of pastures with particular focus on the dry season in semi-arid areas, improvement of pasture quality as well as hay producing and storage. Farmers' interactions with extensionists greatly increased (>80% of the sessions organized by extensionists), while the participation of scientists decreased (<40% organized by scientists).

Video recordings have further contributed to impart lessons learned in previous meetings.

Three new farmer groups were initiated involving women and men. They aimed to improve the nutritional status of local communities, to yield supplementary income through sales of goat milk and to regenerate endangered fodder trees. In addition, 23 highly motivated women established a new group keeping a local

breed of 275 chickens. As a result of the knowledge sharing, several farmers have reported improved household incomes and food security through improved agrodiversity activities and resource management. KUMO PLEC farmers' group have mobilized village members to plant trees in a community based action which was attended by one member of the Vice President Office of the Department of Environment. As the farmers' efforts were recognized at the national government level, they were strongly encouraged to continue PLEC work.

An impact assessment of PLEC was carried out with an objective of ground truthing what changes have occurred in line with PLEC expected achievements after four years of implementation. Literature surveys, Geographical Information Systems and experts' discussions helped identification of two potential districts for replication of PLEC approaches, including new sites of Tarime highlands in Mara region; Maruku-Kyamulaire sites in middle altitude Bukoba, district, Kagera region and all neighboring wards in Arumeru district. Moreover, the field activities in Arumeru area were expanded to cover additional villages with special emphasis on semi-arid lands.

## 2. Reports and Workshops on Models

Chapter-lengthen reports were revised and to be submitted soon. Additionally, paper on "Soil management and agrodiversity: A case study from Arumeru, Tanzania" was completed.

## 3. Capacity Strengthening

PLEC farmers participated in two study tours to the Lyamungo Coffee Research Centre and the Agricultural Research Centre at Selian where they received training on improvement of plant genetic resources, water harvesting and coffee disease control. Two leaflets and two booklets were prepared for distribution of knowledge on pest control for coffee, beans and round potatoes, composting techniques and the use of compost with regard to ameliorate the soil quality and crop management strategies. Farmers have requested further study tours as they highly appreciated the educative value.

PLEC farmers continued to learn best practices from expert farmers on poultry production, improvement of income-generating agrodiversity, including production of tree seedlings. The chicken management experience was shared with more than 50 women. 57 farmers visited an expert farmer to improve their knowledge on income generation through agrodiversity. Furthermore, a farmers' group in Arusha conducted a training session on raising indigenous tree seedlings.

PLEC Tanzania work has also been integrated in extension services by the Ministry of Agriculture, Forestry and Community Development and sister projects on natural resource management (Traditional Irrigation Project TIP and the Soil Conservation and Agroforestry Project SCAPA). This offers opportunities to train extensionists, field workers of development and conservation on PLEC approaches.

The capacity building further grew through research activities carried out by one student from East Anglia University.

## 4. Networking and Dissemination

PLEC Tanzania took the opportunity to introduce the project approach and present its findings in a variety of occasions, workshops and publications, i.e. in national agricultural shows, in the regional workshop on Integrated Soil Fertilizer Management (ISFM) and in the regional Internal Project Review (IPR). The UNU/PLEC management meeting was hosted in May 2001.

The close collaboration with the Ministry of Agriculture, Forestry and Community Development as well as two sister projects, namely the Traditional Irrigation Project (TIP) and the Soil Conservation and Agroforestry Project (SCAPA), has efficiently facilitated networking and dissemination of PLEC findings.

## Uganda sub cluster



Greater emphasis has been given to data analysis, reporting and planning, strengthening of farmer groups in the Bushwere site. Involvement of Makerere University students as trainees in both field-based activities and data handling has significantly increased. Farmer-to-farmer sharing of experiences is now based on the expert farmers training members of different PLEC farmers associations and groups.

#### 1. Demonstration Site

Emphasis has been given on agroforestry, crop and livestock interactions, forestry and nursery management through activities of five PLEC Farmers Associations and undergraduate student research projects and vocational student field attachments. PLEC has facilitated farmer associations in streamlining their objectives, registration, some meetings and networking as well as provision of some crucial farm inputs. Farmers' groups were facilitated to host the Stakeholders Field evaluation workshop on 18th July 2001.

The five farmers associations include:

- (i) "Bushwere Zero-grazing - Crop Integration Association (BUZECIA) with a membership of 12 households. It is registered, with a bank account and has written a project proposal to solicit funding from the GEF Small Grants Programme. Three members have initiated zero grazing cattle units learnt from expert farmers, one of them is a member of BUZECIA.
- (ii) Bushwere Nursery and Home Gardens Farmers' Association (BUNUHOGAFA) with a membership of 27 people the majority of which are women. It is also registered with a bank account using part of the earnings from the joint project. The group has received training on nursery and tomato crop management, conducted by one group member (expert) with technical back up from the Field - Agricultural and Forestry Extension workers. BUNUHOGAFA has also prepared a project proposal to solicit funds from various donors, including GEF Small Grants Program and a Women' Credit Facility.
- (iii) Bushwere Development Group (BUDEG) composed of 10 youthful members, focusing on commercial tree nurseries, bee keeping and goat production as well as a revolving fund project; targeting at raising capital for long term improvement of the Bushwere community. Expert farmers on afforestation and apiculture - based agroforestry were facilitated to train the group on tree nursery management, selection of tree species and afforestation.
- (iv) Kisirira Womens' Group, which have nurseries and all season vegetable homegardens and
- (v) Mwizi PLEC Experimental Farmers Associations (MPEFA).

#### 2. Biodiversity and Agrodiversity Assessment

The agrodiversity and biodiversity data collected have been entered in the standardized database form and submitted to UNU. Extra database was designed for banana crop biodiversity and also submitted. The accompanying reports has been submitted. Monitoring of changes in agrodiversity and biodiversity continues.

#### 3. Participatory Rural Appraisal

The chapter length report on the relation of community information to scientific information on resource assessment and landuse (report 6) was completed and submitted.

#### 4. Experimental Work

Monitoring of farmer experiments continues with assistance of graduate trainees. Evaluation of results by both farmers and community workshops continues and discussions on technical and policy recommendations are underway. The various farmers groups and some individuals have initiated income-earning activities especially in apiculture, agroforestry, nurseries and vegetable growing.

#### 5. Reports, Workshops on Models

Stakeholders' field workshop to evaluate PLEC work in Bushwere took place 18th July 2000. Two community workshops and two national level stakeholder workshops are underway. A field visit has been made by the area Member of Parliament.

#### 6. Capacity Strengthening

One M.Sc. student (female) completed and successfully defended her M.Sc. thesis. Four other M.Sc. students ( one female and three males) and one Ph.D. student (male) continued involvement in PLEC,

including thesis research, data collection and analysis. Six undergraduate students (5 males and 1 female) are currently developing their field research work. Four are based in Bushwere Demonstration site.

Two Bushwere youths (males) who are in an Agricultural college continue to participate on PLEC field activities during their vacation.

#### 7. Networking and Dissemination

Collaboration with two Mbarara University staff continues. Networking with Tanzania Cluster has been cordial and arrangements are underway for PLEC-Uganda to attend the Regional East African Meeting in Arusha.

Two core scientists participated in TSBF - Afnet regional workshop in Arusha and presented two PLEC - related papers. Both have since then participated in developing research proposals on managing soil biota for improved agricultural productivity and integrating indigenous and scientific knowledge on Agrobiodiversity.

#### 8. Co-ordination and Planning

Co-ordination with scientific coordinators especially Prof. Stocking, has been regular submitted a the Uganda team revised proposal for Plec future.

### Kenya Sub-Cluster

#### 1. Demonstration sites

Demonstration site activities continued at the Embu sites. Interactions among individual farmers and community groups were enhanced through field days and farmer-to-farmer meeting for sharing experiences. Such group meetings, where farmers explained about their own experimental work or activities for income generation, have encouraged individual farmers to pay a follow-up visit to the site that interested them. In July 2001, a tour was organized for farmers to one site in Embu where soil management has been successful in reducing erosion, and to another site in Meru where an individual tree nursery for medicinal, fodder, ornamental, fruit and timber was developed.

Demonstration and explanation of farmers' activities were carried out on farm and facilitated by technical support of PLEC researchers who made group visits to the farms. For example, farmers demonstrated top working of a new coffee variety, Ruiru 11, to existing coffee variety, control of Yellow headed coffee borer, coffee under Ficus, and potatoes and pumpkins growing in the existing coffee field. The techniques are still in process with new technologies being tested by farmers, e.g. Khat and macadamia growing.

A new potential site for PLEC methodology has been identified in the Mt. Kenya regions characterized as agro-ecological zone as well as main and marginal coffee and tea-coffee growing zone.

#### 2. Biodiversity and Agrodiversity Assessment

Assessment of changes at landscape level and analysis in view of biodiversity loss and conservation have been achieved to a large extent and is still continuing. For example, during rainy season in April 2001, information on cropping patterns /combinations practiced by the Nduuri farmers were collected in order to determine whether there are any changes within the Nduuri farming landscape due to the dwindling fortunes in the coffee sector. It was also intended to document the type of crop rotations and combinations practiced by the Ndduri farmers. The information was gathered by use of maps drawn for thirty-two participating farms with location of every crop. The information from the maps is being compared with those collected during similar season in 2000 to see biodiversity change.

Assessment of fruit and vegetable diversity as well as distribution and domestication of indigenous crops was carried out for six days from 13-20 June 2001. A survey was conducted by all PLEC team members and the extension agents of the Ministry of Agriculture and Rural Development, in the form of questionnaire to forty farmers. The results indicated that a number of new crops (e.g. tea, soya bean, climbing beans, macadamia, tomatoes, kales, brinjals and new banana varieties) have been introduced in

the areas from neighbors, research centers and local markets during the past five years, which has forced most indigenous crops decreasing in number. The survey revealed that there was lack of knowledge on food preservation in time of excess.

A survey on the role of Livestock in land use system and biodiversity was conducted in Nduuri, August 2001. In this survey, crop production, biodiversity, soil fertility, family welfare and wealth were assessed in homes with and without livestock. The data is being processed for analysis.

### 3. Outreach and Experimental Work

Initiatives on income generating activities for farmers have been recorded. Such activities included diversification strategy in coffee field by increasing biodiversity as well as irrigation project that helped growing high value horticultural crop in a well timed market. Other activities for income generation included introduction of *Catha edulis* in farms and intercropping of *Catha edulis* in the coffee field, and adoption of commercial crops such as sweet potatoes, Irish potatoes and cassava.

Farmers' experimental works have been evaluated through visits to the farms, interviewing farmers, and taking samples for analysis. The results were reported back to individual farms and farmer groups in a meeting.

### 4. Report, Workshop on Models

A meeting for presenting the results of the farmers' trials and observations made from various management systems was held at Nduuri Primary School in June 2001. Thirty-six farmers attended the meeting. The farmers also explained the reasons for undertaking certain activities and the benefits and difficulties that they observed. The meeting provided the farmers with an opportunity to probe and record several agro-biodiversity issues including: recent plant/crop introductions, conservation of traditional crops, initiatives for diversifying income earning activities, and listing of extinct or threatened vegetable and fruit species.

Two chapter length report on the Embu for the period of 1 April 2000-31 March 2001 was compiled and forwarded to UNU in April 2001. Collecting and filling the gaps of biodiversity data has been conducted using the standardized format. The compiled database was sent to UNU in September 2001.

### Ghana Sub-cluster

PLEC in Ghana is turning out to be successful story. It can be determined by various outputs, especially the effective use of expert farmers to demonstrate and extend various resource conservation and development activities, as follows: biodiverse agroforestry based on traditional practices; Oprokwa or proka, a farming system that conserves biodiversity by avoiding fire to clear vegetation and by the use of chopped vegetation for mulching; exchange of germplasm and farming knowledge among farmers; management of plant nursery and arboretum; forest regeneration; management of conserved forests; and generation of income or additional value from conservation through activities such as apiculture and snail farming.

There has been popular recognition of the PLEC purpose and approach as a means of achieving both conservation and development particularly through farmer associations and expert farmers. Also, the enthusiasm of school children for the PLEC purpose was observed. The PLEC achievements demonstrate the promise of an alliance of scientists, farmers and policy agents as a strategy to improve rural living conditions on the basis of local knowledge.

#### 1. Demonstration Sites

Various demonstration activities were carried out at the leading demonstration sites led by expert farmers through the PLEC Farmer Association, in collaboration with government agencies (e.g. Ministry of Food and Agriculture, and District Assemblies) and NGOs (e.g. Ghana Rural Reconstruction Movement and Heifer International Project). Success of the demonstration site activities were driven mainly by following facilitating factors: placement of one PLEC farmer as Chief Farmer in one demonstration site (Amanase-

Whanabenya). The influence of the farmer has made PLEC activity reach out to other farmers in its neighborhood; integration of school children and females; expansion of PLEC to other neighboring areas for popular demands; increase of bio-diverse farming based on PLEC principles, such as agroforestry.

For example, demonstration of on-farm “yam management” was initiated by expert farmers in Gyamfiase-Adenya (southern Ghana), focusing on techniques of planting, staking, harvesting and storing, in situ in the soil, unharvested small yams used as seeds. This activity has led yam farming diversified and spread to other sites in southern Ghana.

Also, conservation of over twenty varieties of “yam” was carried out in a demonstration plot in Bongnayili-Dugu-Song (northern Ghana), in collaboration with local PLEC farmers association. This activity has led to conservation of disappearing yam varieties as well as propagation of rare yams among farmers.

In a conserved forest in backyard as well as in an agroforestry home garden, two expert farmers in Sekesua-Osonson demonstrated bee-keeping (for honey and wax) as a means of income generation. This activity led to remarkable spread of bee-keeping to another thirty farmers in the site as well as other sites in northern and southern Ghana. Especially, the activity in Sekesua-Osonson has attracted substantial financial support from a Ghanaian affiliate related to an American NGO.

Furthermore, demonstration of medicinal plant conservation through arboreta was practiced by two expert farmers in southern Ghana. This activity has promoted awareness of conservation of assorted medicinal plants and its techniques. One of the expert farmers has started generating modest income through the activity.

## 2. Biodiversity, Agrodiversity and agro-biodiversity

Generation of relevant information on biodiversity, agrodiversity and agrobiodiversity was completed through the field work on a sampling basis with a special focus on crops management, especially yams. Database development and analysis are in progress.

## 3. Participatory Rural Appraisal

Gaps in work on social population are on threshold of completion. Analytical reports embodying household characteristics and their relationship with agrodiversity should start flowing to UNU soon.

## 4. Outreach and Experimental Work

Various experimental activities were carried out in participation of farmers. Some examples of the activities are as follows:

- Experiment to determine trees that combined well with food crops and the optimal tree-food crop spacing was conducted in southern Ghana. Output of the activity is under assessment in light of claims by farmers.
- Experiment in forest regeneration was carried out by expert farmers in order to rehabilitate degraded grassy patches caused by deforestation. The experimented techniques has been adopted by other farmers such as migrant-settler tenant farmers.
- Experiment in semi-intensive commercial breeding of giant African snail was carried out in a conserved forest patch owned by an expert farmer in Gyamfiase-Adenya (southern Ghana). This activity has impacted on growth of snail population and demonstrated its commercial value.

Above activities were aimed at generating more income from biodiversity. As a result, income has been promised from the biodiversity-rich citrus farms established on a group-and privately owned basis with PLEC support. Also, The activity of bee-keeping is expected to be provided with material and technical support by an NGO, Heifer International Project.

## 5. Reports, Workshops on models

Fieldwork by scientists has been de-emphasized in favor of data assembling and analysis. Relevant data for the PLEC proposition that biodiversity is positively correlated with good management is being in

process. Towards the test; is in development a matrix having a measure of floral diversity as a depending variable, and several other indices as independent (potential explanatory) variables. Results and analysis will be reported to UNU and the reports were enhanced through discussions at the 6th WAPLEC Regional Workshop in October 2001 in connection with policy implications and future directions of PLEC work.

#### 6. Capacity Strengthening

Capacity strengthening was promoted in the form of PLEC-supported farmer training and exchange of knowledge and germplasm through visits. For example, through PLEC-sponsored training programme at University of Ghana Agricultural Research Station (ARS) in southern Ghana, over one hundred farmers learnt grafting/budding and split-corm techniques for plant propagation. Through subsequent farmer-to-farmer demonstration and training, about forty farmers have been actually practicing the techniques.

Capacity building was also enhanced through apprenticeship of students in administration, fieldwork and analysis, and through support for post-graduate research.

#### 7. Networking and Dissemination

Networking among field sites within Ghana was maintained by the WAPLEC Leader's visits to the central and northern groups. Within southern Ghana, networking between scientists, farmers and policy agents were promoted through regular meetings. Overall networking was maintained by correspondence with the UNU, the scientific coordinators, regional advisors, the Guinea sub-cluster, and the central/northern groups of Ghana. Further networking is expected through interactions over the forthcoming WAPLEC book, and through the 6th WAPLEC Regional Workshop in October 2001.

#### 8. Coordination and Planning

Under the overall stewardship of the WAPLEC coordinating Leader, the PLEC office staffed by an Administrative/Research Officer, a Secretary and a Driver in the Department of Geography and Development continued to serve as the principal coordinating node for PLEC work in Ghana and West Africa as a whole.

#### Guinea Subcluster

During the first six months of Year Four, the Guinea Sub-Cluster has achieved a number of activities led by local farmers at demonstration sites in Pita and Kouroussa Prefectures. Many farmer groups were formed to acquire agricultural techniques from PLEC scientists and expert farmers. A number of capacity training activities were conducted for farmers and students, and farmer-to-farmer meeting were enhanced for exchange of techniques and experiences. The literacy training for female adults continued and expanded in Misside Heire, Pita Pref.

##### 1. Demonstration site

Many farmer groups were formed to acquire agricultural techniques from PLEC scientists and expert farmers. For example, a new group was formed in Pita Pref. by a distinguished farmer, and the group has already brought benefit to farmers in acquiring a technique of compost production through training led by PLEC expert farmers. In Bantignel, Pita Pref., one group of one hundred and twenty members participated in demonstration activities, such as compost production and potato cultivation, led by two expert farmers. Within demonstration sites, increasing productivity and incomes of vegetable gardening, cereals and agro-forestry was observed at three sites in Pita Pref. and at one site in Kouroussa Pref.

During this period, farmers put their substantial effort in planting degraded soils with *anacardium occidentale*. This action is important to sustain the land against bush fires during dry season. In Misside Heire, Pita Pref, area of three ha size was planted by PLEC collaborative farmers, and area of more than 5 ha size was afforested by local people.

The most successful activity was dying cloth which has been practiced as a means of income generation in Bantignel, Pita Pref. The group was formed in 1998 with nine members, and it has been expanded with

twenty-seven members at present. Each member has learned and well acquired dying techniques. Every two months, the group produces about eighty suites. In face of competition for selling their products, the group started making collaboration with local people in further areas around 1,000km and sending their merchandize there to maintain sales.

## 2. Biodiversity, Agrodiversity and Agro-biodiversity

A complementary inventory of agro-biodiversity was carried out within the agro-forestry system at Misside Heire and within some tapades and arboretum at Dar es Salam and Goloya sites in Pita Pref. The collected data is being integrated into the Agrobiodiversity Database.

## 3. Outreach and Experimental Work

A research on the contribution of tapades to local livelihood was carried out. A main objective of the research was to compile a list of farming crops, land areas, production and destination of each crop. Also, research activities were carried out at Moussaya, Kouroussa Pref., with focus on various subjects, such as experience of farmers in identification and vernacular classification of soils; indigenous techniques of soil conservation and cultivated crops; origin, perception and traditional ways of handling bush fire.

## 4. Reports, Workshop on Models

Guidelines for farmers were written with focus on techniques such as: 1) establishment of nursery of agro-forestry species and vegetable gardening, including soil preparation, implementation of nursery, transplantation of young plants, technical harvest and conservation of projects; 2) cow sheds building, management and compost production; 3) agronomic of yam; and 4) livestock breeding. A feedback of the achievements was held in Bantignel and chaired by the Prefect of Pita. Approximately one hundred participants from various social groups attended the gathering.

Synthesis reports, including socio-economic study of the Guinea demonstration sites, analysis of database on agrodiversity and agrobiodiversity, comparative study of demonstration sites in the mountain and semi arid areas, and final report, will be sent to UNU in November 2001.

Land occupation and land use maps of Misside Heire were compiled and submitted. A land use map of different PLEC sites in Bantignel is being completed. A map of Moussaya site, Kouroussa, will be drawn.

## 5. Capacity Building

### 1) Training of farmers and students:

Many training courses have been conducted at research centers and institutions for farmers and undergraduate students. For example, agronomic cultivation of yam was developed at the Centre de Recherche Agronomique de Bordo, Kankan, upper Guinea. Also, technical extraction of honey without use of fire was developed at the Ecole Nationale d'Agriculture et d'Elevage de Bordo, Kankan.

In Pita Pref, eight farmers, including two farmers who were collaborative with PLEC, were trained in cow shed management by one associate PLEC researcher. Some demonstration techniques, such as setting grass layers under sheds and its collection for use in mounting aerial compost, were emphasized. A number of sessions were conducted at Misside Heire, Goloya, Hinde and Dar es Salam. A group of soap makers including twenty-one members has learned a technique of using local materials, instead of imported products, in a training session led by one neighboring villager.

Literacy training in Fulani language for women adults at Misside Heire, Pita Pref., has been successful. The number of women joining the group has been increasing year by year since it was started in 1999. PLEC has been providing support to the group by covering monthly payment for teachers. Two women were registered during the last six months, and the total number of participants has now grown from eighteen at its beginning to twenty seven at present, including two male learners. Participants are learning the language in groups divided by three levels and have been making improvement in writing and reading skills.

A total of nine students (eight from Université de Kankan and one from Université de Conakry) were trained during this semester. The training focused on PLEC methodology related to agrobiodiversity inventory and rural appraisal.

## 2) Farmer-farmer meetings:

Farmer-to-farmer meetings were continued. For example, expert farmers in Pita Pref. met many other farmers from neighboring villages to teach and hold discussion on various topics, such as how to make compost by using refuse and cow dung, how to manage plant nurseries, how to lead transplantation from nursery to field, how to take care of young plants; how to manage cow sheds, and how to make soap by using local materials.

Two PLEC collaborative farmers from Bantignel, Pita Pref. arranged many meetings with participation of farmers from neighboring prefectures with focus on compost preparation, agronomic techniques of vegetable gardening and cow shed building. Such farmer-to-farmer meetings showed that PLEC collaborative farmers are willing to exchange their experiences with other farmers wherever they are needed.

In Moussaya site, four bee-keepers held demonstration sessions with those from NGO named ACTPAK (Association pour la Commercialisation et le Traitement des Produits Agricoles de Kouroussa). These farmers have been doing their best to bring a lot of people from their village to the sessions in order to share experiences and generate household income.

## 6. Coordination and Planning

The National Meeting of the Guinea Sub-Cluster, titled “Agro-biodiversity and rural development sustainability”, were organised at University of Conakry, Guinea, in September 2001. Guinea Sub Cluster members also participated in the 6th WAPLEC regional Workshop in October 2001.