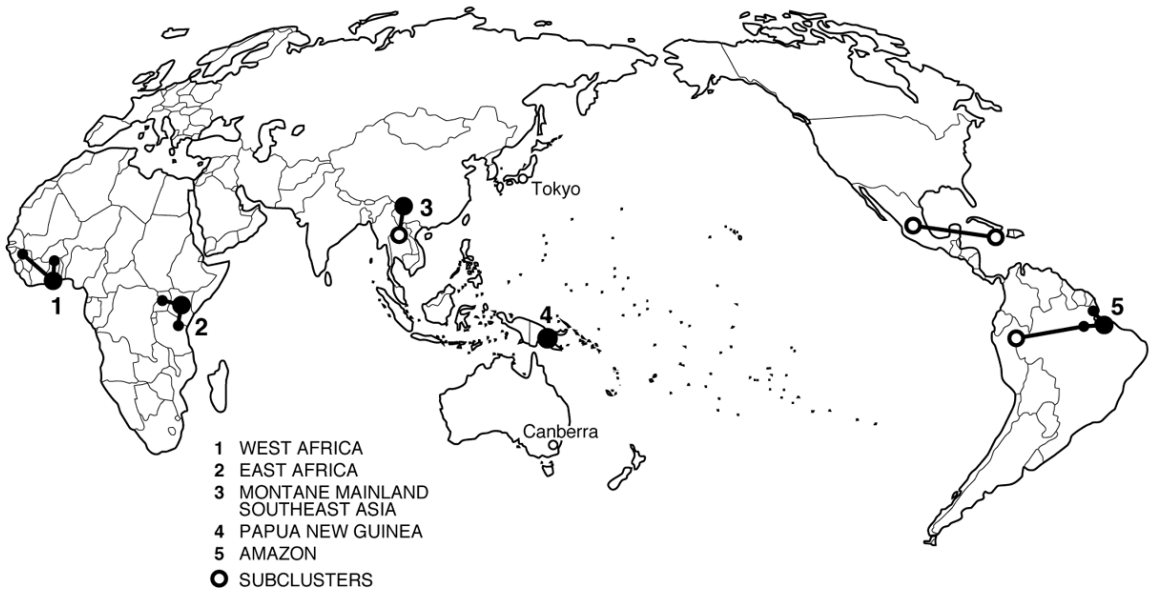
THE UNITED NATIONS UNIVERSITY Project
on People, Land Management and
Environmental Change (PLEC)

# PLEC NEWS AND VIEWS

No. 17 February 2001




**The Clusters of PLEC**

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***P L E C  N E W S  A N D  V I E W S***

**No. 17 FEBRUARY 2001**

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# PRINCIPAL SCIENTIFIC COORDINATOR'S REPORT

## PLEC ENTERING ITS FOURTH GEF YEAR

**Harold Brookfield**

### Progress, good but uneven

Global Environmental Facility funding became available to the larger part of PLEC on 1 March 1998, and will come to an end on 28 February 2002. This issue of *PLEC News and Views* therefore appears at the very end of the third year as programmed in the Project Document. In fact, PLEC began a long time before 1998, and ways of continuing PLEC work through and beyond 2002 are already under serious discussion, as reported below. Whatever is to come will, however, be much less centralized than in the past, and the key role of this periodical will not endure—as with the present coordination structure, its place will have to be taken by something else.

Reports on progress during the third GEF year are not yet due, and (as of late January) two Clusters have still not reported on their work up to mid-year in August 2000. In both cases, the Cluster leaders have been significantly promoted in their home organizations and have found it hard to keep up with their project obligations. In addition, some other reports were late and the suite of reports that was sought in December 1999 still remains incomplete. In general, PLEC members have found the fairly heavy programme of reporting set out in the Project Document to be burdensome, and this has been particularly so for the leaders. Especially since all are part-time, they find writing reports takes them away from the real work of PLEC in the field and, because report writing has to be done in their offices, PLEC's demands can conflict with those of their regular jobs. All this notwithstanding, some excellent reports have been received.

Uneven progress is only to be expected in a decentralized project such as PLEC. Clusters recognized as performing well from the first year have continued to perform well, but with some unexpected checks in unexpected areas. We have realized how utterly dependent PLEC is on the enthusiasm of a small number of people, and on their ability to continue to give a lot of time to the project. It is also very dependent on the quality of the institutional bases in the Clusters, and the level of interest they take in what we do.

The Mid-term Review proposed that we should reduce the support given to Clusters that performed less well than others, and increase it in others. The reviewer expected additional funds to become available, and proposed they be handled competitively. In fact, in the fourth and final year, the total budget is less than it has been in the first three years, and the problem becomes the better use of less, rather than the allocation

of more. There was some over-optimistic expansion of demonstration sites in the first two years. This has had to be offset by closing down work in a few sites where there had been slow progress, or where the demands of doing good work greatly exceeded the limited resources available to Clusters. Where there has been real success, on the other hand, work is still being expanded into neighbouring or even remoter communities. Clearly, this requires some redistribution of resources. Some hard decisions were being taken at the time of writing this report.

**Demonstration sites in the fourth year**

A great deal of work has now been done by farmers and scientists together in a majority of the demonstration sites, still numbering 21 within the GEF countries and 25 in all, even after the excisions described above. Limited work, at a much lower level, still goes on in three or four other places. PLEC's hard-working Demonstration Activities Advisory Team, consisting of Miguel Pinedo-Vasquez and Edwin Gyasi (now both members of the consolidated STAT), have visited sites in East Africa, China, Papua New Guinea and Thailand during the past 18 months. They also met in Ghana. Together with their colleague Kevin Coffey, they have written the major paper on demonstration site work that forms the principal content of this issue. Also included in this issue is a paper describing the rather different approach being followed in Papua New Guinea.

In October 2000, farmers from all the Amazonian demonstration sites, including that in Peru, came together to exchange ideas in Iquitos, Peru. Before this issue will have appeared, another important meeting will have taken place in Tanzania, a workshop involving farmers and stakeholders on 'Strategies for involvement of stakeholders in agrodiversity conservation'. Decision makers will attend this workshop, and policy recommendations will be discussed. Miguel Pinedo-Vasquez is also attending. Earlier, a successful field day was held at the Tumam demonstration site in Papua New Guinea, in October 2000, preceded by a workshop and attended also by Kanok Rerkasem. Not least worthy of mention among Cluster initiatives at their demonstration sites is the determination of the northern Ghana group to sustain the work among women farmers on conservation of indigenous rice varieties at Manga-Bawku in the Upper East Division. This had been imperilled by the death of the scientist in charge, Charles Anane-Sakyi, in August 2000. A paper on this conservation topic is printed at page 31.

**Data analysis**

Kevin Coffey's *Agrodiversity Database Manual*, somewhat delayed by unanticipated printing problems in New York, was finally made available to all parts of PLEC in October 2000. It succinctly describes how data should be entered into a database, and how some simple queries can be asked of the resulting tabulations in MS-Access. It is also available for other readers on the PLEC website [http://www.unu.edu/env/plec/]. One major use of it that is envisaged for analysis in 2001 is a series of tests of the relationship between management diversity and biodiversity. Each Cluster has nominated a member to be mainly responsible for database entry and numerical analysis, and all are linked together with Coffey through an e-mail network.

Several Clusters and groups have identified additional data analysis tasks, arising out of the recommendations of the Mid-term Review, and the electronic debate conducted between August and November. During 2001, with less new field research to be undertaken, data analysis will become a major project task. This is being built into the new 2001 contracts now being prepared.

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## OBITUARY: EDWARD NSUBUGA

We deeply regret to have to announce the death from pneumonia of Mr. Edward Nsubuga, an Agricultural Economist in PLEC-Uganda, on 10th January 2001, at 40 years of age. He was a lecturer at Makerere University at the time of his death.

Joy Tumuhairwe writes: 'He was one of the first three Scientists on the Uganda sub-Cluster. Most of you may recall him at the 1998 Mbarara general meeting. He was generally quiet but a careful planner and writer. Edward was a rib in the PLEC-Uganda team, on socio-economic aspects. He willingly worked under all conditions (thin or thick, even uncertain). PLEC-Uganda will certainly have a hard time to find a replacement. Among other things, Edward was in charge of capacity building of Bushwere PLEC farmers to do economic analysis of their conservation efforts, in order to help them appreciate that biodiversity is not only for ecological but also for economic benefits. He had already acquired fluency in Runyankole-Rukiga (rare for a Muganda man) to comfortably relate and work with the people. The Bushwere farmers will miss him for this and the entire PLEC-Uganda team will miss his lively stories that helped ease the fatigue on the long drives to and the strenuous walks up and down the steep hills of Mwizi'. May his soul rest in eternal peace'.

## PUBLICATIONS

### The PLEC book

In October 2000, Harold Brookfield and Michael Stocking visited Intermediate Technology Press in London to discuss the proposed PLEC book with the publisher, Helen Marsden. The idea was warmly accepted in principle, subject to the opinion of an external referee on a sufficient body of material. This had to include several of the papers at least roughly edited into the form in which they will appear, and the draft introductions to each section by the three editors, Brookfield, Padoch and Stocking. Many of the papers will be revised (or in a few cases reprinted unaltered) from papers that have already appeared in *PLEC News and Views*, but others are newly written for this book. As of now, the three introductions have been drafted, some of the papers have been modified to eliminate repetition between different papers that was present in the originals, and the proposed final content of the rest of the book has been determined. All this material has now been sent to London before the end of January. Assuming we get the go-ahead, the remaining papers will be assembled and edited (largely by PLEC's research assistant Helen Parsons in Canberra) in March–June, and hopefully the whole manuscript can be sent to London by July. The provisional title of the book is ***Understanding, Analysing and Using Agrodiversity***. We believe it will have a good deal to say that is new in the larger literature.

### The special issue of a journal

This has been under discussion for a long time, and there has been limited progress. Now, Michael Stocking has agreed to take over control of this initiative. He will soon be in communication with authors of the very few papers that were offered in response to earlier requests, and with potential additional authors. In this way, the IT Press book and the special journal issue will come to be handled quite separately, which should facilitate more rapid progress on both.

### Prizes for papers published or offered outside PLEC channels

As previously advised, PLEC now announces a call for published or unpublished papers written by PLEC members for a competition Prize. Papers offered may already have been published during the last few years, or accepted for publication outside PLEC's own channels (i.e. not in *PLEC News and Views*, the 1995 special issue of *Global Environmental Change*, or the forthcoming book on *Understanding, Analysing and Using Agrodiversity*). Alternatively, they may be

unpublished, but in final form ready for publication. The prize for the paper deemed best will be $600 and the authors of two runner-up papers will receive $200. In the case of a multiple-authored paper, the prize will be awarded to the primary author. Distribution of the award among secondary authors will be the responsibility of the primary author.

*Eligibility*

The first author must be a PLEC member as confirmed by a leader or sub-Cluster leader. Scientific Coordinators are excluded. Any number of co-authors are allowed. The primary author must certify that the paper is based upon original research and that the authors listed reflect the contributions.

*Topic*

Topics should be based upon PLEC priority issues including, but not limited to: monitoring or analysis of agrodiversity, demonstration activities, expert farmers, agrodiversity, methodologies for the study of agrodiversity, etc. The paper must be interdisciplinary in nature and cannot be a technical paper limited to a traditional discipline. Inquiries to Christine Padoch, or Harold Brookfield, can be made if in doubt about appropriate subject matter. Non-final drafts will not be accepted.

*Due date:* 1 July 2001

*Send to:*

Dr Christine Padoch
Institute of Economic Botany
New York Botanical Garden
Bronx
New York NY 10458-5126
USA

e-mail: cpadoch@nybg.org

*plus* a copy to

Professor Harold Brookfield
Department of Anthropology, RSPAS,
Australian National University
Canberra, ACT 0200
Australia

e-mail: hbrook@coombs.anu.edu.au

*Selection*

The selection committee will consist of Christine Padoch, Harold Brookfield and two judges from outside PLEC who are familiar with the PLEC project.

*Announcement of winners* will be made before the end of October 2001.

## THE FINAL REPORTS

In their 2001 contracts, the GEF-PLEC Clusters are being asked to bring together basic information on their demonstration sites. They are also required to provide short histories of the work done in and around demonstration sites under PLEC, together with an evaluation of what the Clusters believe they have achieved. The non-GEF Clusters (Thailand, Peru, Mexico, Jamaica) have already been asked to do the same in the new contracts which they received in September–October. These reports, given a size-limit of 5–10,000 words, should be publishable after editing, and will form the core of PLEC's final output. This will probably be published in book form in 2002. We owe this much to UNU and the GEF, and the information provided should satisfy those who wish to know more about our demonstration sites. This is further discussed below in the report on the Rome Advisory Group meeting in November 2000.

## MANAGEMENT GROUP MEETING IN MAY

The Management Group of GEF PLEC will hold its next, and probably final, meeting at Arusha in Tanzania in early May 2001. The meeting will discuss all remaining matters required for the completion of the present 1998–2002 GEF-PLEC. The Management Group consists of the Cluster leaders, the Regional Advisers, the members of the Scientific and Technical Advisory Team, and the Coordinators, together with the principal staff in Tokyo.

## THE FUTURE OF PLEC

A major topic for the meeting in Arusha will be the future of PLEC. Here the electronic forum 'PLECFUTURES' which began in July, and now has 24 messages posted on it, is important. Unfortunately, a lot of people who are interested in the future of PLEC, including very many of PLEC's members, will not have seen these messages. For a while, I ran the forum myself, but when Christine Padoch ended a fairly long period in which she was away from New York, she resumed control and is now the 'moderator' of the list.

### *From Christine Padoch*

In her introductory message, in November, she wrote:

I'm sure we were pleased that virtually all the responses to the initial questions sent out by Harold through the PLEC Future Forum were highly positive. It's clear that PLEC—in some form—should continue after 2002. The fact that all Clusters as well as the UNU agree that PLEC should continue is gratifying, but this is no time to be content with our past successes. Any continuation requires us to think about our future and, above all, requires funding, which, as PLEC's history amply illustrates, can be difficult to get. The unanimous decision to push forward calls for both candid reflection on our current condition and the development of multiple strategies for future efforts.

While PLEC will not terminate in 2002, our current GEF funding and the project document that binds us will. Most of us feel that the continuation of PLEC as it is today is not a realistic option. As it has done before, PLEC must modify and redefine itself. We should try to change without compromising PLEC's core philosophy. That PLEC is generally on the right track is confirmed by the very PLEC-like direction of the GEF's new Operational Programs: Agrobiodiversity and Integrated Ecosystem Management.

As some mainstream conservation and development efforts move in our direction, it is time for us to (a) thoroughly examine our strengths and weaknesses, (b) build upon what we've done, and (c) investigate and pursue funding opportunities.

Our mid-term reviewer suggested a decentralized PLEC. This does not preclude an international structure for PLEC. In examining our weaknesses perhaps we can admit that some centralized components were less successful. For instance, the grouping of multiple countries into one Cluster has led to difficulties. Perhaps too many directives and decisions seemed to emanate from the top without enough consultation. We did have successes too. Among the more successful aspects of the international structure has been the continuous exchange of ideas among PLEC members. Specifically we should be pleased with (a) PN&V and numerous journal publications, (b) meetings and conferences that brought together PLEC members to share their experiences, (c) international teams (BAG and DAT) addressing specific issues from diverse backgrounds and experiences, (d) inter-group workshops, etc.

We should now strive to maintain what is best in the international structure, while giving individual Clusters the independence they want. Perhaps PLEC should largely be an international facilitative body that aids the individual PLEC projects to find funding, brings together its group of scientists in conferences and workshops, creates international teams to address common issues, and publishes our findings, but gives Clusters greater leeway in exactly what needs to be accomplished and when. This structure would give individual Clusters more room to develop methodologies more specific or appropriate to their study sites, focus on issues within PLEC that more closely reflect the researchers' experiences, expand the PLEC philosophy into new areas, and/or combine PLEC with other projects. A more independent structure might allow for greater flexibility in procuring funds. Aside from the PLEC project, groups of Clusters could join together and seek funding for related issues. This decentralized composition would make PLEC more adaptable to changing opportunities. Furthermore, this network does not have to be limited to current PLEC Clusters. To have more independence, however, Clusters would also need to find independent funds.

Another important issue is the direction of any changes in our current emphasis. Several PLEC scientists have suggested a greater stress on capacity building. This might include the development of materials and activities for the training of technicians, extension agents, as well as students, in the PLEC approach. Some PLEC Clusters might want to develop in this direction, others might want to go another way. No matter which way we go, each Cluster must be looking for funding. I know that most of you have already begun this task. Here is another suggestion.

An interesting source for many PLEC Clusters may be the GEF Medium-Sized Project Program. Here is the web address: http://www.gefweb.org. If you have further questions that I or someone else in the PLEC family could help you with, please post a note to the forum or e-mail me directly.

### *New GEF operational areas*

Michael Stocking drew attention to the new GEF operational areas in more detail. He wrote:

> The GEF website now has a 15 November 2000 draft of Operational Program 13, which is likely to be the key OP for any new PLEC. It is posted at the following address:
>
> http://www.gefweb.org/Whats_New/whats_new.html
>
> On reading this (much changed from earlier versions) I was very much struck by how PLEC-like the revisions have become and how the GEF Eligible Activities that address the objectives of CBD in agricultural biodiversity give an excellent checklist for those who may be thinking about any new PLEC. Those in Para 19 on p.6 would seem especially relevant:
>
> (1) integrating agricultural biodiversity conservation and sustainable use objectives in land use and natural resources use management plans;
>
> (2) identifying and conserving components of biological diversity important for sustainable use of agroecosystems, with regard to the indicative list of Annex I of the CBD;
>
> (3) demonstrating and applying techniques to sustainably manage biodiversity important to agriculture, including wild relatives of domesticated plants, animals and their gene pools;
>
> (4) supporting capacity building efforts that promote the preservation and maintenance of indigenous and local communities knowledge, innovation, and practices relevant to the conservation and sustainable use of agrobiological diversity, with their approval and involvement;
>
> (5) incorporating components of targeted research (including diversification of crops) important for the conservation and sustainable use of agricultural biodiversity in programmatic intervention when instrumental for the achievement of GEF biodiversity program objectives in specific ecosystems and countries consistent with national priorities; and
>
> (6) including sustainable use awareness components, when relevant, in program objectives that are consistent with national priorities.
>
> There are strong trends towards management of agricultural biodiversity, especially in (2) and (3), and mention of research in (4). In Para 20, soil conservation and restoration of degraded areas is specifically mentioned in its relation to biodiversity.

There have been subsequent messages by Christine and Timo Maukonen, discussing both the content and structure of PLEC. They provide a good deal more information on the very PLEC-like new GEF initiatives, and about ways of going about the job of generating funds for the future. These messages are too long to be reproduced here.

### *Necessary action*

One issue that has clearly emerged is that we are talking about country projects, maybe integrated into an international network that UNU is still willing to sponsor: we are not talking about a new centrally-directed and centrally-funded project. The real work has to be done at Cluster level.

I urge all those who have an interest in a debate that is growing, to become much more serious in the coming months and to join the list. Write to Christine (cpadoch@nybg.org) with a copy to Kevin Coffey who knows all about the technology of electronic lists (kcoffey@nybg.org).

## Symposium on Farm Management of Biodiversity

Since the subject was raised at the Rome meeting (see page 8), a joint symposium between PLEC, IPGRI (International Plant Genetic Resources Institute) and the CBD (Secretariat of the Convention on Biological Diversity) is being firmly planned. The topic is 'Farm Management of Biodiversity', and the location and dates are in Montreal, Canada, 8–10 November 2001, to take place immediately before a meeting of the Subsidiary Body on Scientific, Technical and Technological Advice on Biological Diversity to the Convention (SBSTTA), also in Montreal.

There will be a significant delegation, perhaps 10 people, from PLEC. Most papers will be invited, but posters can also be received. Details will be circulated once the Steering Committee is formed and has commenced its mainly-electronic discussion. The basic idea is to exchange information

and experience on working with farmers who manage biodiversity, and to develop ideas and recommendations for future work in this area. PLEC and IPGRI have been in touch for some time exchanging ideas and experiences, and the idea of this meeting was proposed at the Rome meeting of PLEC's advisory group. It is now moving to the stage of forming a steering committee, and securing adequate funds.

The justification of the proposal in an early draft document is as follows:

Much has been written on loss of managed biodiversity under threat from commercial and intensified production, but only limited work has been done on how farmers manage their resources so as to sustain and enhance them. To develop practices and systems for sustaining this managed biodiversity, the Project on People, Land Management and Environmental Change (UNU/PLEC) has been developed since 1993 by the United Nations University. It involves a collaborative effort between scientists and small farmers from across the developing world. In the same period, IPGRI has developed a global project on 'Strengthening the Scientific Basis of *in situ* Conservation of Agricultural Biodiversity', involving a similar range of collaboration.

There is need to bring together experience and ideas on farm management of biodiversity within the two above projects of UNU and IPGRI, and projects of other partners, including for example specialists in the fields of agricultural production , soils and water, and to make an impact on international and national biodiversity programmes and policy.

**Suggested themes** are:

*What are the principal mechanisms /frameworks within which farmers select and manage biodiversity at all levels (the landscape /agroecosystem, species and genetic diversity)?

*What project practices have been most successful in empowering farmers' methods for biodiversity conservation, and what obstacles and bottlenecks have been encountered?

*What are key factors that make some biodiversity-rich farming practices profitable and productive in a market economy? Can these practices sustain food security in future?

*What are the challenges that future efforts to sustain farmers' management of biodiversity will have to meet?

*How should national and international programmes and policies on biodiversity conservation be adapted to support on-farm management of biodiversity?

## PROMOTIONS

PLEC as a whole should congratulate Guo Huijun and Romano Kiome, on their substantial promotions during 2000. Since February 2000, Guo is Vice-President of the Xishuangbanna Tropical Botanical Garden, the largest unit within the Chinese Academy of Science operations in Yunnan. After a period as Acting-Director, Kiome became Director of the Kenya Agricultural Research Institute in September. KARI is the largest agricultural research institute in sub-Saharan Africa. One has only to recall what these two men were doing when we first got to know them, in 1993, to realize how far and how fast they have risen.

## NEW ANU TELEPHONE AND FAX NUMBERS

From the 1st January 2001 the Australian National University has new telephone and fax numbers. The PLEC Canberra Office numbers are now:

Tel: +61 2 6125 4688/4348
Fax: +61 2 6125 4688/4896

E-mail addresses remain unchanged.

### ADVANCE NOTICE OF PUBLICATION OF HAROLD BROOKFIELD'S BOOK

On page 40 is a black and white copy, just received, of the Columbia University Press flyer for *Exploring Agrodiversity*. We think it will interest all of you.

Canberra Office

# PLEC ADVISORY GROUP AND ASSOCIATED MEETINGS IN ROME, 3 AND 6 NOVEMBER 2000

**(revised from a report to UNU dated 15 November by H. Brookfield[1], Liang Louhui[2] and L. Jansky[2])**

[1] PLEC Project, Australian National University, Canberra
[2] PLEC Project, United Nations University, Tokyo

## The Advisory Group meeting, Friday, 3 November

The second Advisory Group meeting was held at FAO in Rome on 3 November 2000. UNU Vice-Rector Professor Motoyuki Suzuki was in the Chair. Those who attended are listed below.

Opening remarks were made by Professor Suzuki, Dr Funes and Mr Maukonen. Dr Funes remarked that PLEC is of great relevance to FAO. A very supportive statement about the project from the Secretariat of the Convention on Biological Diversity was tabled. After further opening statements by Liang, Brookfield and Stocking, the first part of the discussion focused on the Mid-term Review and on general matters arising from the presentations. Among those who commented, there was surprising unanimity of view that the Mid-term Review was inappropriately directed, in particular in its emphasis on a reductionist approach, downgrading of the landscape or ecosystem context, and the disciplinary orientation of the proposals.

There was a strong view that PLEC's work is of great international value, especially in serving as a model to other projects in its farmer-to-farmer approach, and in its use of a landscape-level perspective. There was, however, agreement with the mid-term reviewer that the focus of the project, very good at the global and country levels, needs to be made more precise at ecosystem and Cluster levels. The actual nature of the Cluster output is insufficiently articulated: what, in particular, does the farmer get out of it? It is necessary to identify outputs at each level. The science and research benefits emerge clearly, but the farmer benefit needs more stress.

It was also emphasized, especially from ICARDA, TSBF and IPGRI, that our sites should be seen as benchmark sites, and that information on them needs to be presented in systematic form, and geo-referenced, so that they can be used by others and compared. It was hoped that members of other projects might use our sites. The degree to which this can be done is, however, constrained by considerations of intellectual property rights. A subsequent clarification, by Brookfield, is appended. The landscape (or ecosystem) level emphasized by PLEC was seen as input of importance in the general field of agricultural biodiversity. Others are finding themselves pushed in this direction.

There was discussion of the role of scientists in projects such as PLEC, and of the need to change the attitude of scientists for collaborative work with farmers. Other initiatives, as well as PLEC, have experienced problems in bringing economists, social and natural scientists together, and a good model is needed. There was also a need to feed into policy and biological strategy plans at national and global levels, and to emphasize this aspect strongly in the final reports and meetings. Although it was argued that PLEC seems insufficiently cognizant of the interest now taken by developing-country national governments in biodiversity, it was also stressed that PLEC should demonstrate what its collaborating government institutions have been able to learn from a project which runs contrary to most national government polices for agricultural development.

This part of the discussion included a considerable amount of question and answer, in which a number of PLEC difficulties were explored and sympathetically discussed. Clearly, many of the same problems arise in other networking projects. The exclusive focus on small farmers was questioned, in the context of scope for synergy with ministries of environment and agriculture in devising new policies and strategies, and in retraining agricultural extension scientists. Questions were asked about the degree of focus on how farmers absorb and manage diversity. We were reminded that, notwithstanding the recent emphasis in discussion of agricultural biodiversity on within-species diversity, the intention of the biodiversity programme was always inclusive. It was asked how demonstration sites are to achieve results at national level.

The second part of the meeting was concerned with activities of other projects, and linkages with PLEC, and then with the future of PLEC. A detailed statement was presented by IPGRI, with its 9-country programme on Strengthening the Genetic Basis of the Conservation of Plant Resources. The project is tending to move forward from its initial base in within-species diversity, and is widening its partnerships. Its participatory approach has been a new experience for IPGRI, as has the multi-disciplinarity of the *in situ* conservation programme.

Bram Huijsman, Managing Director of ETC, talked about ILEIA He was very supportive of PLEC and offered to provide all Cluster and Group leaders with copies of the ILEIA journal *LEISA*, and the new *COMPAS*. Adel El-Beltagy discussed ICARDA work on agro-biodiversity, and offered to bring PLEC into association with the chair of the FAO Interdepartmental Working Group on Agricultural Biodiversity (Dr Mahmud Duwayri), which was done immediately after the meeting. Finally, George Brown discussed the Tropical Soil Biological Fertility Project, and its need to build on PLEC experience. Michael Stocking is one of the directors of this project.

The future of PLEC was the final topic for discussion. There was a very strong statement by Toby Hodgkin (IPGRI) that there should be no question but that a second phase is needed—the appropriate length for PLEC should be much as is envisaged for the IPGRI *in situ* project—8 to 10 years. Several others supported this view. There was also solid insistence that an international network is necessary, so that the aim can be a genuine global product. Without a network, there is danger of loss of experience and learning, and hence of the global benefits of PLEC work.

In order to foster synergy between relevant initiatives, it was proposed that UNU together with relevant partners jointly organize an international symposium on farmers' management of biodiversity, both agricultural and natural. This was supported by the Chair and meeting participants and the item was followed up by an associated meeting at IPGRI (see page 10).

This was a very successful meeting for PLEC, which received very substantial support, and is clearly felt now to have a great deal to offer, especially internationally through its contributions at the global level.

**Meeting with Dr Mahmud Duwayri and Ms Linda Collette, Chair and Secretary of the Interdepartmental Working Group on Agricultural Biodiversity, FAO, 6 November**

For PLEC, this meeting was attended by Brookfield, Jansky and Liang. This meeting first exchanged information between PLEC and the FAO Working Group. M. Duwayri then proposed that PLEC participate in the meeting of the liaison group on agricultural biodiversity organized by CBD in collaboration with FAO to be held on 24–26 January 2001 in Rome The topic would be to survey the planned ecosystem approach

to agricultural biodiversity, and review other related issues. The CBD seeks case studies, and PLEC is asked to supply material (possibly most simply from recent suitable articles in *PLEC News and Views*).

### Meetings with Dr Toby Hodgkin and Ms Jessica Watson, in IPGRI, 6 November

For PLEC, the meeting was attended by Brookfield and Liang. The meeting with Toby Hodgkin had two main objects. First was to compare experiences and seek IPGRI advice on moving into a second phase in which country initiatives must be of primary importance, and there can be much less central direction. IPGRI has to deal with multiple funders, most of whom have now approved the second phase. The method has been to provide 'shell documents' to each participating country group, which have then developed their own proposals within these shells. The final stage has been a series of workshops, most of them attended by the project coordinator, in which details have been finalized. There are variations in emphasis between different country proposals, especially in regard to the balance between science and development, but the method has ensured that there are sufficient common elements.

Second, and more important, was to discuss a proposal made during the Advisory Group meeting that PLEC and IPGRI should collaborate in organizing a conference on 'Farm Management of Biodiversity'. The meeting would need to be planned well in advance and for this reason Hodgkin proposed that it should be associated with the anticipated SBSTTA-7 meeting at the CBD in Montreal, Canada, in November 2001. UNU would be the principal sponsor of this conference, but it was hoped that CBD would also be prepared to give sponsorship. The purpose should be to bring together experience and ideas on farm management of biodiversity within the two projects, and among others, including for example agricultural production people, soils and water people. Once agreement between the three parties is reached in principle, a steering committee will be formed.

### Meetings in FAO on the new Land Degradation Assessment Project (LADA) and WOCAT, 6 November

Stocking, accompanied by Jansky, held meetings also in FAO with Dominique Lanteri and Rod Gallacher, on FAO's new Land Degradation Assessment Project (LADA) and on the World Overview of Conservation Approaches and Technology (WOCAT). D. Lantieri, FAO Environment and Natural Resources Service, Sustainable Development Department is leading development of a new Land Degradation Assessment project that is currently at PDF-A stage. Anthony Young, their consultant, has developed a questionnaire and Michael Stocking will record how PLEC database techniques can be of assistance. One of the main topics of discussion concerned how to situate biophysical assessments into a form that can be taken up in policy. The value of the WOCAT database was also discussed.

### List of attendees at the Advisory Group meeting[1]

***Invited participants***

Adel El-Beltagy (ICARDA)
George Brown (TSBF)
Bram Huijsman (ETC/ILEIA)
Jeff McNeely (IUCN)
Coosje Hoogendoorn (IPGRI, also representing ISNAR and CIFOR)
Toby Hodgkin (IPGRI, also representing ISNAR and CIFOR)

[1] The small attendance from within FAO, remarked on by several participants, was due to an unfortunate set of circumstances. It became apparent that a communication failure with UNU during Brookfield's absence in October led to only a few of those whom he met in FAO in September 1999 being informed of the meeting.

Sheila Mwanundu (IFAD)
Santiago Funes (FAO Rural Development Division)
David Palmer (FAO Rural Development Division)
Michelle Gauthier for El Hadji M Sene (FAO Forestry Department)

***Participants from UNU, UNEP and PLEC***

Motoyuki Suzuki
Libor Jansky
Luohui Liang
Iwao Kobori
Timo Maukonen
Harold Brookfield
Michael Stocking

**Appendix: Clarification by the Principal Scientific Coordinator on the issue of making available information on PLEC demonstration sites**

PLEC Clusters need to assemble and present data on the physical and managed characteristics of the demonstration site areas under a clearly defined and comparable set of headings, together with data on site populations and their characteristics. While this material is available for all sites, it is presently not organized in a systematic way, and a guideline statement (in the form of a set of headings and sub-headings) will have to be prepared. The question of biodiversity data and its presentation is covered in the recent guidelines, which provide for the creation of summary tables for wider use.

It has always been envisaged that site characteristics should be concisely presented in the final reports, for general information. For text, only brief statements per site are envisaged, with all detailed information remaining the property of those who collected it, including their collaborating farmers.

There may sometimes be reasons not to reveal even the broad location of a PLEC demonstration site, but several papers presented to *PLEC News and Views* have SHOWN these locations by maps at topographical scale (1:50,000 to 1:100,000). Unless there are good reasons for not doing so, this much would be acceptable practice in the final reports and other documents.

The specific locations of field sites, woodlots, housegardens, etc. and of sampled quadrats (which are required to be physically marked on the ground to facilitate re-survey) are available to the Clusters only, sometimes with detailed geo-referenced information. These have never been published and only rarely have been specified in internal reports; PLEC does not recommend that they be published. In the database guidelines now made available there is provision to provide geo-referenced information in a confidential field which, like detailed uses of specific plants, will remain confidential and not be published or included in any generally-available database.

Members of other projects wishing to work in PLEC sites will first have to approach the Clusters concerned, not UNU or any central coordination. Cluster leaders may at discretion decide to introduce them to collaborating farmers, and show them specific locations in company with the farmers and with the farmers' agreement. The demonstration sites are, by project policy and in reality, the property of the farmers, and their collaboration must be secured before any of the detailed data collected together with PLEC scientists can be accessed.

# PAPERS BY PROJECT MEMBERS

## PLEC DEMONSTRATION ACTIVITIES: A REVIEW OF PROCEDURES AND EXPERIENCES

**M. Pinedo-Vasquez[1], E. Gyasi[2] and K. Coffey[3]**

[1] Center for Environmental Research and Conservation (CERC), Columbia University, New York
[2]University of Ghana, Legon and Co-ordinating Leader, WAPLEC (West African Cluster of PLEC)
[3] Institute of Economic Botany, New York Botanical Garden, New York

*The paper that follows is the principal end-document of PLEC's Demonstration Activities advisory Team (DAT), which was set up in 1999, and is now incorporated in the new Scientific and Technical Advisory Team (STAT), together with remaining members of the old Biodiversity Advisory Group (BAG). DAT comprised the first two authors of this paper, Pinedo-Vasquez and Gyasi. Coffey had latterly become a consultant to BAG, and is now also a member of STAT. In the transition period he accompanied the DAT members on their visits to China and Thailand in July–August 2000 (Eds).*

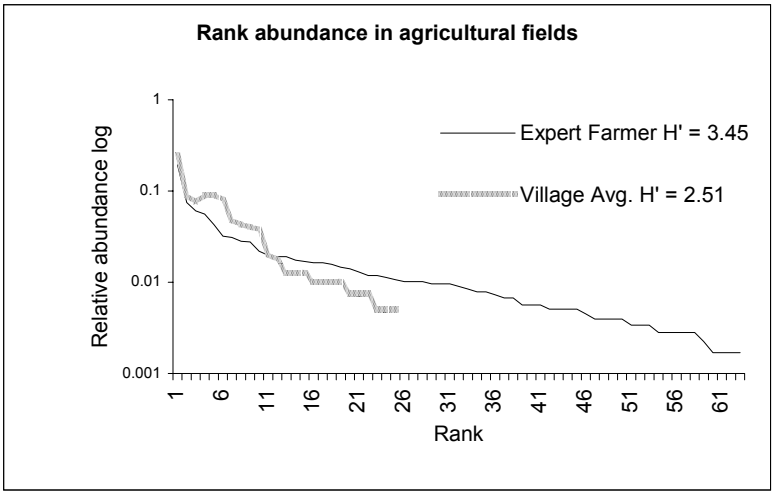
Farmers in a community located in northern Thailand complained to a team of PLEC scientists that prices of the crops—cabbage and lychee—that had been widely promoted as a substitute for opium poppy cultivation, fluctuated greatly and rarely yielded them a good profit. One villager stood out. He disclosed that he did not suffer such economic ups and downs. When market prices for these two ubiquitous crops were low, he turned to his other crops: peanuts, ginger, bananas and others. Or he fed the cabbage and lychees to his pigs, chickens and ducks and then sold or ate them. This farmer's strategy was different from that of many of his neighbours. It was, however, similar in principle, although not in specifics, to strategies of successful smallholders around the globe. He mixed his market crops with a diversity of other species and varieties of annuals, semi-annuals and perennials. The farmer managed a highly heterogeneous landscape that also allowed him to plant or manage a plethora of wild, semi-domesticated and domesticated crops at the edges of his landholdings. When less successful farmers from the village were asked their opinions of why this particular villager was doing well, they answered that 'he knows more than we do about making a living by farming.' This farmer exemplifies PLEC's 'expert farmer', a smallholder who successfully solves production problems by using biodiversity. Box 1 gives production details for a female expert farmer in Amazonia. Such expert farmers are the keystone of the PLEC programme and the most fundamental resource in PLEC's demonstration activities.

### Introduction

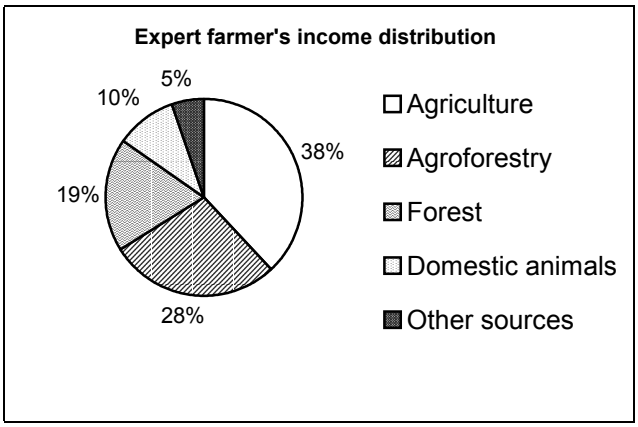
The PLEC-facilitated demonstration activity is ideally a farmer-driven group with the conservation of agrodiversity and the improvement of farmer livelihoods as outputs. The optimum activity achieves both conservation and development objectives. This is clearly no easy task. A particular activity may require the participation of government agents, NGOs, scientists, researchers, technicians, extensionists and farmers. Bringing together such an eclectic group of participants necessarily results in complex, sometimes contentious interactions. The complexity is heightened because the various actors assume unfamiliar roles during demonstration activities. Expert farmers, rather than scientists or extension agents, supply and transfer the technical knowledge. PLEC members facilitate, monitor, observe and record this process. The other participants,

**Box 1 Expert farmer's diversity and income**

PLEC expert farmers are chosen to teach their own agrodiverse and profitable management techniques. One of PLEC's great expert farmers has developed an innovative strategy to deal with market changes. She has created and perfected complex agrodiversity systems and techniques to increase crop diversity and other related biodiversity on her landholdings.




As shown in the rank abundance graph and calculation of Shannon's Index (H'),she maintains over twice as many species in her agriculture field than her neighbours. The expert farmer has profited from this diversification. From 1993–1999, she had an average net income over five times the legal minimum wage in Brazil. The wide range of products that she produces in her fields prepares her for fluctuating markets and allows her to maintain a high income. Recently, the income of most residents of the village has become more dependent on timber and other forest products. Despite these trends her main source of income is derived from the sale of agricultural products, as shown in the pie chart. Her expertise in profiting from agro-biodiversity is a valuable source of knowledge to be shared. She has become one of the key experts in PLEC's approach of farmers teaching farmers.




ranging from policy makers to farmers, learn from the expert farmer in the hope that the new techniques or experiences will benefit their own work: sometimes this develops into a two-way process. The knowledge gained from farmer-instructors is used by farmers to enhance their production, by project directors to advance their goals of implementing development with biodiversity

conservation, and by PLEC scientists to further develop our methods.

The integration of conservation and development objectives within a single project is not unique to PLEC (Brush 2000; Agrawal 1997). In countries where PLEC Clusters are operating there already tend to be many integrated conservation and development projects. A review of recent projects in the fields of conservation and development reveals that although the two ideas are often linked, they are rarely truly integrated. In most projects the union of conservation and development seldom goes beyond the title of the project and refers, at best, to the fact that a project includes separate conservation and development components. This pseudo-hybrid type of project actually offers trade-offs rather than integration. In return for following the conservation agendas of projects, local people are offered some activities meant to promote economic development or poverty reduction.

The PLEC approach differs from this currently widespread model. The PLEC framework is exceptional because it not only integrates the conservation of agro-biodiversity with activities aimed at raising rural incomes and capacity building, but it does so in a single activity. The goal is a unity, not a trade-off. PLEC uses the results of its site assessments to identify the instances where conservation and development are concurrently integrated and practised by smallholders. PLEC researchers and technicians rely on expert farmers to identify and understand production technologies that are biodiversity rich, economically profitable and environmentally friendly.

Conservation and development initiatives have employed a plethora of approaches for developing and transferring selected practices among smallholders (Phillips 1994; Feder and Rosenzweig 1987). A common strategy has centred upon the development of 'improved' methods at universities or experimental stations. Extension agents then teach farmers the new methods. The ineffectiveness of this method, however, has encouraged attempts to reverse the direction of the transfer to make it more 'bottom-up,' 'farmer-based,' and '*in situ*.' Projects have enlisted community leaders to help in this transfer, effectively delegating to them the role of extension agents (Bebbington 1994). The results have been mixed. Some projects have shown that farmer leaders are effective and efficient teachers. Other projects have been hindered by the fact that

- farmer leaders often lack experience and may be the least successful farmers in the community,
- their techniques may not be replicable by the less fortunate in the community, or
- the technologies that they are promoting were designed in research stations and are poorly adapted to local conditions (Agrawal 1997).

Another variation on the design of smallholders learning from their leaders has promoted community groups, organized by gender or specialization (e.g. banana producers), to teach new technologies to community members (Uphoff 1994). While these experiences often helped community groups gain power, they resulted in few real advances in the use of improved and appropriate technologies among small farmers (Phillips 1994). Experts have different opinions on why this group-centred approach has failed. The suitability of the techniques promoted is questionable. Few research station-designed models help farmers in marginal areas deal with the complex limitations they encounter. Questionable techniques hinder the success of such projects regardless of who transfers the knowledge. Failure to adequately appreciate differences in knowledge among members of groups has also been suggested as a reason for lack of success (Scoones and Thompson 1994).

PLEC builds upon knowledge gained from these past approaches, but is unique in its attempt to understand and use the variation

among households, and to facilitate the dissemination of successful variants. The teachers are not extension agents, community leaders, or cooperative farmers, but rather expert farmers, who themselves have developed technologies and other knowledge to respond successfully to changes in natural and social landscapes.

## Expert farmers' technologies

Acknowledging expert farmers' technologies constitutes the core of the PLEC demonstration approach. PLEC's approach does not try to categorize conservation practices, production systems and techniques into indigenous and non-indigenous categories. Neither do PLEC demonstration activities exclude technologies or products developed outside the communities and adapted by smallholders to local conditions. Smallholder technologies are promoted regardless of their origin. This creates a space for the identification and selection of expert farmers from among the best agriculturalists, agroforesters, forest managers and conservationists. Through the identification and support of these expert farmers, PLEC promotes the dissemination of practices—no matter what their provenance—that resolve problems produced by changes in the market, government policies, and/or the natural environment.

PLEC demonstration activities show that when expert farmers are acknowledged, their technologies and experiences are valued and quickly assimilated by the other farmers. For example, in West Africa expert farmers are recognized as instructors in formal gatherings, organized by PLEC members, of farmers' associations, scientists, extension agents, and policy makers. In Ghana, expert farmers have taken the lead in the discussions regarding new policies, community needs, and agricultural research. Many PLEC Clusters, including those in Amazonia, China, and Ghana show that even gender-based prejudices can be overcome. Several of their most active and respected experts are women farmers.

*The PLEC demonstration advisory team (DAT) had opportunities to visit most PLEC demonstration sites, observe their activities, and talk to farmers, scientists, and officials. This paper is based on our experiences and observations over the last two years. We provide a framework to elucidate the steps used by PLEC members to plan and carry out demonstration activities. We list the kinds of information that are needed for identifying and selecting expert farmers and technologies that they will then promote through demonstration activities. We review some of the results of demonstration activities and highlight the problems and difficulties that we encountered as well as some of the encouraging results. We also list some specific concerns expressed by Cluster participants about the economic viability and ecological sustainability of the production and management techniques that PLEC farmer-instructors are disseminating.*

## Assessment and analysis in organizing demonstration activities

In order to make more readily understandable the multiple steps and actors that lead to a successful set of demonstration activities, we developed a flowchart (Figure 1). The chart shows how PLEC demonstration activities are based on knowledge gained through research into the farmers' natural and social environments. We hope that the flowchart will stimulate further modification and adaptation of the process to fit better the many realities encountered in PLEC sites and beyond. It provides ideas based upon a diversity of activities and approaches that can be expanded upon (Guo et al. 2000; Kaihura, Ndondi and Kemikimba 2000; Abdulai et al. 1999; Padoch and Pinedo-Vasquez 1999). It should be viewed neither as a straitjacket nor followed as strictly as a cooking recipe. There are many ways to achieve the goals

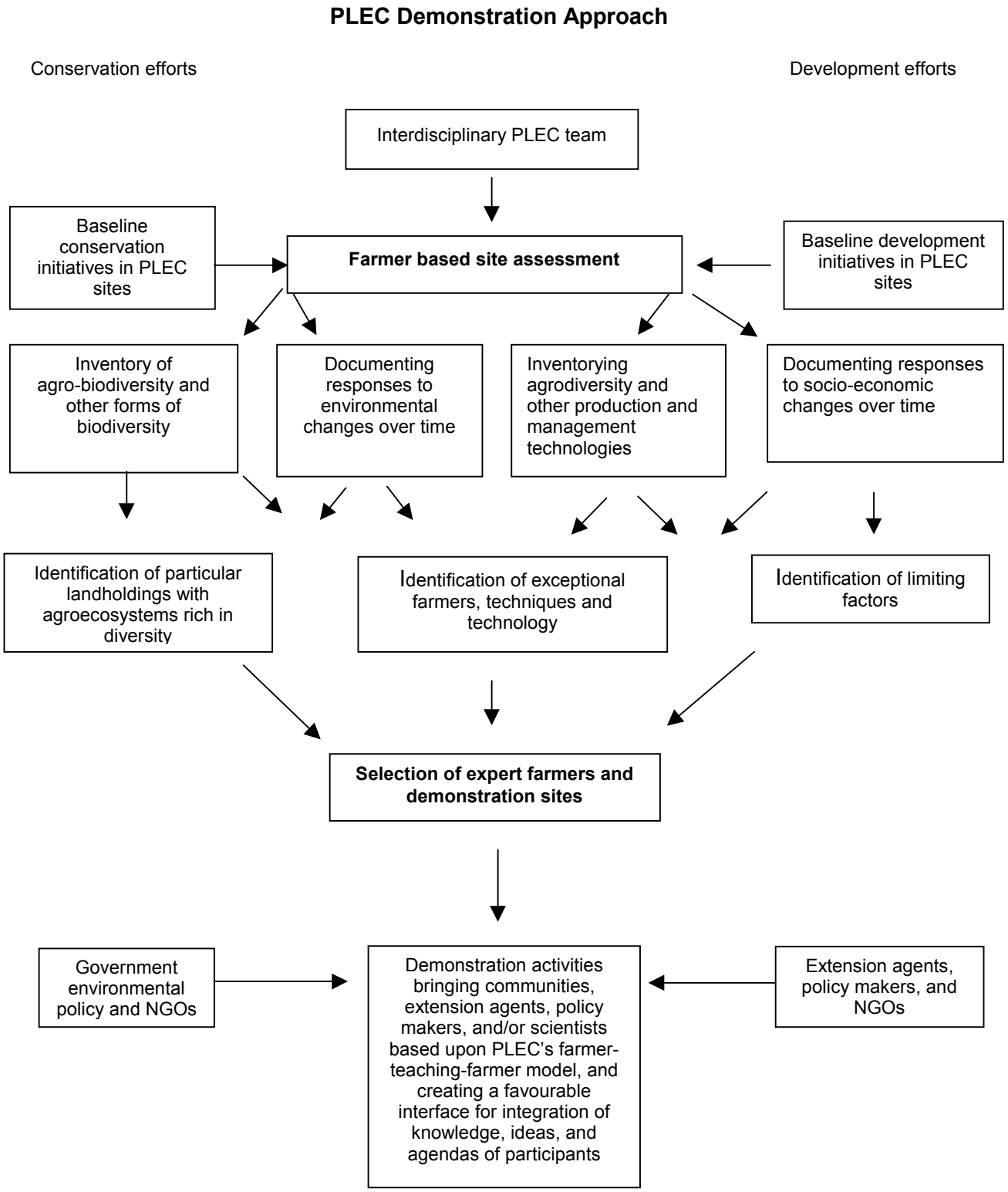



**Figure 1 Flowchart showing how PLEC demonstration activities integrate conservation and development**

of PLEC demonstration activities. This flowchart is offered to provide guidance on some of the essential components for planning, executing and monitoring demonstration activities.

**Assembling an assessment team**

The simultaneity of both conservation and development is central to the PLEC demonstration concept. To achieve this harmonization, PLEC Clusters begin their work with rigorous, multidisciplinary assessments of the variation among households that make up the communities at their demonstration sites. Each group must bring together an assessment team. The make-up of such teams in PLEC has varied considerably. They differ in the number of individuals involved, the time they can spend in the field, their backgrounds and the specialized knowledge they bring to the task. All Clusters include experienced researchers and exceptional farmers in their assessment teams. In some cases, the teams also include respected extension agents, local authorities, and religious leaders. The inclusion of external individuals must be done without compromising the basic goals of the assessment.

An important issue which should be taken into account during the assessment, is the different types and degrees of outside intervention in the form of conservation and development efforts that have been, or are currently taking place in the community. To include persons closely identified with conservation or development efforts that use an approach incompatible with PLEC's, might severely prejudice the assessment teams' outputs. Care taken in assembling teams is always important, and will be rewarded not only in good research results, but later when the demonstration activities take over as the central element of the Cluster's work.

Local farmers play a special role as members of the assessment team. Their knowledge of the community, local production technologies, resources, and landscapes is invaluable to a perceptive and reliable inventory process. The ties that the PLEC team can forge with selected farmers while doing assessments can also be important for the success of later demonstration work.

**Farmer-based site assessment**

Farmers, especially expert farmers, are at the core of all PLEC demonstration activities (Brookfield and Stocking 1999; Padoch and Pinedo-Vasquez 1999; Pinedo-Vasquez 1996). To identify those farmers and technologies that might contribute most towards the improvement of the community's development and biodiversity conservation, and to identify the needs, trends and priorities of communities, all PLEC Clusters carry out detailed and multi-focused site assessments. The multiple objectives and specific methods for carrying out the assessments have been covered in several other PLEC publications (Zarin, Guo and Enu-Kwesi 1999; Brookfield, Stocking and Brookfield 1999). Here we will add only a few pertinent observations.

Many of the outputs of the assessments supply the data and create the foundations necessary for the successful planning and implementation of demonstration activities. PLEC's agro-biodiversity inventories, for instance, provide a picture of the existing variation in the level and type of biodiversity in different households' holdings. Identifying those that maintain large quantities of rare and/or unusual species and varieties is a major step in choosing a demonstration activity or farmer demonstrator who can further the complex conservation and development process.

Biodiversity data are complemented with information on the performance of households as social and economic units. PLEC Clusters use the household as their primary unit of measurement and of analysis whenever it is appropriate. In rural areas throughout the world, decisions on how,

where, when, and what to produce are usually made at the household level rather than the community level (Guo et al. 2000; Kaihura, Ndondi and Kemikimba 2000; Agrawal 1997). These household surveys reveal differences between households in a large number of crucial economic and social variables. Knowledge of both the means and ranges in income, labour availability, ownership of capital goods, and other variables, help demonstration teams identify particularly successful, flexible, and resilient farmer households. Research on variations in the types of fields managed, the crops produced, and the technologies employed by the households is necessary to ascertain those technologies that are good candidates for inclusion in the list of activities to be demonstrated.

Site assessments take into account a broad range of information that can also help demonstration teams understand processes of change and the actors that participate in these changes. A variety of ethnoscientific methods can be employed, including the reconstruction of landscape histories and interviewing of knowledgeable villagers. The results of this research have not only helped PLEC scientists understand trends in local biodiversity management, but have also helped identify particularly dynamic, resourceful, and resilient components of the village. These inventories provide an understanding of which of the innovative technologies that farmers are developing might be especially important in helping their neighbours cope with looming problems, or to take advantage of likely opportunities. Such technologies are then chosen for demonstration activities. Historical information on change and households' responses to change in a broad range of environmental, social, and economic factors becomes a most important component of the site assessment for demonstration activity planning.

The PLEC demonstration model assumes that existing biodiversity and socio-economic conditions reflect the conservation practices and technological knowledge of households. Based on these assumptions, the model integrates methods and techniques for documenting conservation practices. The body of information generated during farm-based site assessments provides a clear picture of the problems faced by households, and of the diversity of approaches adopted to deal with environmental and socio-economic changes (Figure 1). The third step in the PLEC demonstration model focuses on the identification of successful households and of landholdings rich in agro-biodiversity, as well as technologies that produce and maintain biodiversity.

**Carrying out assessments for successful demonstration**

After reviewing the experiences of PLEC Clusters in carrying out household and field assessments that could then feed into successful demonstration planning, a few common difficulties are worth mentioning. PLEC teams that were too limited or narrow in their expertise did not manage to achieve the broad-based results necessary for successful PLEC demonstrations. For instance, teams whose members were mostly botanists tended to concentrate on identifying and recording lists of species and varieties present on farmers' lands, but collected limited information on the production systems or conservation practices that gave rise to this biodiversity. Those teams that were composed largely of soil scientists focused on important trends in erosion and land degradation but left the biological diversity, especially of cultivated varieties, as well as management diversity, under-reported. Additional visits to the area were then required. A well-balanced inter-disciplinary team with clearly defined goals will ensure that assessments provide insights from both agro-biodiversity and agrodiversity, as well as landscape and household surveys.

Another common limitation in the identification, documentation and selection of farmer-developed technologies, stems

from a mechanical or perfunctory use of categories and concepts. Some of the terms commonly used to define how farmers organize their crops, such as monocropping, polycropping or intercropping actually reveal little that is useful about the diversity of the farming system, nor how it adapts to change. Greater insights into responses to change can be achieved by dismantling the general categories and recording the technical diversity used at several stages: clearing, hoeing, ploughing, planting, weeding, protecting, harvesting, or fallowing fields. An unthinking reliance on common terms and definitions of cropping systems can lead to misinterpretation of both existing diversity and directions of change.

**Integrating outputs**

The products of the site assessment provide many of the components necessary to plan and organize demonstration activities based on the PLEC approach (Figure 1). Conclusions drawn from agro-biodiversity inventories, socio-economic surveys, and agrodiversity studies supply the interdisciplinary framework upon which activities can be planned. Among the important variables that need to be determined from the assessments are:

1) the crucial economic, political and environmental changes that affect land-use practices and household incomes among local smallholders;
2) the problems that result from these changes, and how local smallholders deal with them;
3) the farmers who are most innovative and successful in dealing with these problems;
4) the technological diversity and specific management technologies developed by successful farmers, and
5) the levels of agro-biodiversity and other forms of biological diversity resulting from the application of these technologies (Figure 1).

The identification of exceptional farmers, techniques, and landholdings does not guarantee that an assessment team has located either the most appropriate expert farmer, or the technique that is best demonstrated. The landholding chosen for the demonstration activity will not always prove to be the best in the long term. Site assessment analysis for prospective demonstration activities should examine the households within the community very carefully to allow PLEC scientists and technicians to discover instances where successful conservation and development effectively merge. PLEC methodology is designed to uncover variation within a community, and identify individuals or groups of economically successful farmers who employ innovative techniques to create or maintain high levels of biodiversity in their landholdings. From among these individuals or groups, members of demonstration teams can select the expert farmers, who then can be invited to show and teach these promising technologies to their neighbours in the course of PLEC demonstration activities.

**Using information on management variation for demonstration activities**

Translating the results of research or field assessments into a successful programme of demonstration activities is not an easy task. Information collected by many PLEC Clusters has, nonetheless, identified many cases that readily show how concentrating on variation and change among villagers can yield a rich store of expert individuals and expert practices that are appropriate for dissemination. A brief example from PLEC's West Africa Cluster is instructive.

Approximately two decades ago, bush fires during an 'El Niño' year severely damaged cacao and other fruit species planted in the fields of small Ghanaian farmers. This event took place in an economic landscape where cacao was already a failing crop: the price of its beans was low, and most Ghanaian farmers were already experiencing a rapid transition from a boom to a bust period in the cacao

economy. In the early 1990s PLEC scientists began assessments of selected Ghanaian villages. They found that a majority of farmers had switched from cacao production to a corn and cassava rotation. Some farmers, on the other hand, had responded by planting a greater diversity of crops. Others had added animal products, including chickens and even snails to their output. This variation in management activities and concomitant diversity in economic success formed the basis for determining what effective demonstration activities might be. Researchers sought to determine what specific techniques were developed in response to a range of economic and environmental changes, and which of these appeared to have become both profitable and biodiversity based. Answering these questions helped members of the Ghana Cluster find appropriate production systems and techniques for incorporation in their demonstration activities.

Identifying and documenting variation in the ways smallholders respond to changes such as those outlined above, provides a repertoire of technologies and practices that can be used for demonstration purposes. Familiarity with and evaluation of these practices is then necessary to determine which technologies or practices are helping farmers deal successfully with change, while also conserving the diversity of species, varieties, environments, and management types. An experience from the China Cluster provides another example.

Smallholders in China are participating in state-sanctioned reforestation programmes. These programmes promote the planting of two fast growing species, but a few innovative farmers have added native species to the mix. The addition of these species was initially observed as peculiar because the rotation time for harvesting these species is three times greater than that of those recommended by state foresters. Through field work, PLEC members found that farmers planting the local species do not need to wait until the end of the rotation of the local trees to reap benefits. The native species create habitats for insects and herbaceous vegetation that favour the growth of mushrooms, wild vegetables and even the raising of chickens. In contrast, areas reforested with only the species recommended by foresters are very low in insects and do not provide varied habitats. The incorporation of the techniques used by the Chinese farmers in reforesting their land with native species is an excellent candidate for promotion through demonstration activities. *It also illustrates the PLEC focus on farmer-developed practices as not backward-looking, and not limited to 'traditional' practices. The expert farmers are dynamic and forward-looking.*

**PLEC demonstration activities: some experiences, suggestions, and cautions**

Over the past two years several articles about demonstration activities, expert farmers, and demonstration sites have appeared in *PLEC News and Views* (Guo et al. 2000; Brookfield and Stocking 1999; Padoch and Pinedo-Vasquez 1999). Many of these articles have stressed that there is considerable room for variation in PLEC demonstration activities. Building upon a common theme, each PLEC Cluster has developed distinct and evolving interpretations of what constitutes an appropriate demonstration activity for a particular situation (Brookfield and Stocking 1999; Padoch and Pinedo-Vasquez 1999; Brush 2000).

Perhaps the greatest challenge has been to resist the tendency for demonstration activities to become standard development and conservation initiatives. For instance, extension agents in several sites where PLEC teams have been working are gradually incorporating expert farmers' technologies into their training programmes. But there is still a penchant for demonstrating 'modern' or 'improved' techniques developed by agronomists and

other scientifically trained experts and to have the scientist or extensionist instruct the farmers. Concerted and constant efforts must be made to ensure that PLEC activities do not merely copy more traditional extension and training models. The familiarity of many project participants with traditional roles, and the resulting tendency to reassume familiar roles threatens the core concepts of PLEC demonstration. *Based on PLEC experiences, the most effective way to confront and overcome these biases is for researchers and technicians to increase the time they spend in the field learning from farmers.*

### *Identifying expert farmers*

Expert farmers can not be identified without scientists having a great deal of field experience interacting with members of the smallholder societies. Other writers active in this area, including Fairhead (1993), have also pointed out that in smallholder communities, promoting exchange of production technologies should begin by identifying who knows what. Among the several characteristics that make PLEC demonstration activities different from standard extension programmes, is that this first step is emphasized. PLEC scientists take much care in identifying expert farmers by first asking who knows what.

The process of identification of expert farmers has proven to be a long and complex one. In many cases village experts on successful and biodiversity-rich systems of management have had unfortunate experiences with scientists, extensionists and development projects and are not eager to cooperate with PLEC scientists. Those who have in the past been singled out and praised as 'progressive' farmers and therefore recruited for multiple projects are now not the ones that are called upon to teach. The new mode of working may prove confusing to many villagers. Experience in Peru, Brazil and elsewhere, also shows that true expert farmers are frequently unwilling to share their knowledge with any or all of their farmer neighbours. The PLEC approach has been careful to consult closely with farmers and allow them to choose which technologies and which part of their technologies they want to impart to all or some of their neighbours. The PLEC group suggests which technologies might be of interest, the expert farmer decides which of those she or he would like to demonstrate.

### *Dissemination of knowledge*

PLEC's focus on demonstration is based on the principle that farmers are always teaching and learning from other farmers. One of the most important products of this mutual exchange of knowledge in smallholder societies is indeed the agrodiversity and agro-biodiversity that we find in landholdings. PLEC recognizes the importance of smallholder technologies and aims to promote them at the local, regional and national level by directing demonstration activities toward different social groups living in the communities and relevant regions. Not only do the techniques disseminated differ, so too do the modes of dissemination. In PLEC demonstration activities villagers usually learn from and exchange experiences with farmer-demonstrators by working together in fields managed by the expert farmers. Only rarely do they sit in classrooms and are never taught by technicians to reproduce technologies developed and tested in experimental fields. Villagers who participate in demonstration activities are always free to try, change or reject the technologies that are demonstrated by the expert farmers.

As part of demonstration activities PLEC recommends 'working expeditions,' where all participants initially visit the fields, fallows, house gardens, orchards and forests owned by the farmer-instructors. These visits help expert farmers to be recognized and respected by the other members of the community, particularly community leaders. A common strategy used by PLEC members is to act as a bridge between expert farmers and the participants in demonstration

activities. After a period of local activity, the level of peoples' acceptance and recognition of farmer-experts usually increases.

### *The camu-camu example*

An example from the Peruvian Amazon illustrates how PLEC methodology actually turned around the extension activities of a more traditional agricultural development project. The promotion of the cultivation of a very nutritious fruit that grows naturally in the area, camu-camu (*Myrciaria dubia* HBK) is an ongoing project of the Peruvian government's Ministry of Agriculture (Pinedo-Vasquez and Pinedo-Panduro 1998). The agricultural development project was built upon the assumption that this product, which was traditionally extracted from the wild, needed to be cultivated: after doing research, the project recommended that camu-camu be interplanted with other species in farmers' agroforestry fields.

A PLEC assessment of local agricultural systems showed that local farmers already plant the fruit, not in one but in eight distinct ways. Most farmers plant camu-camu in clusters to take advantage of areas where rain water tends to accumulate. The agronomists, on the other hand, had recommended that the plants be scattered throughout all areas of agroforestry fields. Cluster planting is one of the most common techniques used in agroforestry systems by Peruvian farmers for the production of camu-camu; it is known as the *vuelito* agroforestry system.

The *vuelito* system allows farmers not only to interplant camu-camu with other agroforestry species, but also to plant beans, water melon and other annual crops within their agroforestry fields. Because the *vuelito* system creates species-rich agroforestry fields and increases the economic value of the plots, PLEC-Peru incorporated this system in its demonstration agenda, aiming its sessions particularly at the government project's technicians. When technicians working on the project participated in the demonstration activities, expert farmers explained camu-camu planting methods and attributes of the *vuelito* system. As a result of these demonstration activities, the *vuelito* agroforestry system is currently being promoted by technicians working in the camu-camu development project.

### *Integration of demonstration teams and delegation of responsibilities*

Although the success of demonstration activities depends largely on identifying and selecting appropriate expert farmers, the composition of the entire team and the attitude of each member towards farmers are also important determinants of success. Based on PLEC experiences a demonstration team can integrate experienced field researchers, technicians and, more importantly, expert farmers. In several cases PLEC demonstration teams have also included extension agents. Where PLEC demonstration teams have been especially successful, we find that PLEC members had developed strong relationships with farmers. In the few instances where team members did not see the need for establishing relationships of mutual respect, demonstration activities appear to have had greatly diminished impacts on the resource use of the community.

The integration of expert farmers into PLEC teams and the delegation of particular responsibilities to each member facilitate both the implementation of demonstration activities and the establishment of demonstration sites. The main role of expert farmers in demonstration activities is to explain and demonstrate their production and management techniques. It is the job of researchers, technicians and other members of a demonstration team to facilitate meetings and activities, make appropriate suggestions, encourage farmer demonstrators when difficulties are encountered, and monitor how farmers are

**Table 1 Some activities to be included in demonstration activities, the topics to be discussed or demonstrated, the role of each group of participants and some expected outputs**

| Participants | PLEC team | Expert farmer | Farmer participants | Extensionists and technicians | Policy makers |
|---|---|---|---|---|---|
| Setting up the meeting | Suggests:<br>(a) possible gathering type for activity,<br>(b) scope of participation,<br>(c) possible invitees | Responsible for selecting:<br>(a) type of gathering,<br>(b) scope of participation,<br>(c) list of invitees | Receive invitation upon expert farmer's approval | Receive invitation upon expert farmer's approval | Receive invitation upon expert farmer's approval |
| Topics to be covered | Present suggestions for topics the expert farmer will cover that reflect PLEC objectives | Chooses topics he/she feels comfortable sharing with participants | Can contribute ideas for pertinent topics | Peripheral role in topic selection process | Peripheral role in topic selection process |
| Role during activity | Provide logistic support, facilitate interaction, and document demonstration activities | Training farmers by sharing knowledge and experience | Learn new techniques and technologies, participate in working groups, and/or share experiences | Documenting and acquiring farmer's approaches to solve problems | Documenting and acquiring farmer's approaches to solve problems |
| Output | Defining monitoring systems and recording responses to farmer interactions | Earns respect for expertise; monetary or resource compensation; learns from interaction with participants | Incorporating or testing newly acquired knowledge in own system | Incorporating or testing newly acquired knowledge from expert farmers in extension activities | Incorporating or testing newly acquired knowledge from experts in policy discussions |

adapting or rejecting the techniques learned in demonstration activities. This is one of the reasons why members of a demonstration team need to be in the field at the occasion of each demonstration activity.

Results of the demonstration activities need to be evaluated constantly and these evaluations fed back into further planning. PLEC teams may assist by proposing suitable and productive members of a team. They can define roles and provide some insights into what results might be expected from demonstration activities. We have constructed a table to serve as a guide to the possible or desirable role of team members, expert farmers, participant farmers, extension agents and policy makers in demonstration activities (Table 1). We also suggest some outputs of the activities that might be expected from the successful performance of all participants in demonstrations (Table 1). The main goal in presenting the table is to help others who might be interested in building their demonstration activities in a manner similar to that followed by PLEC Clusters.

All the components of Table 1 can be expanded, reorganized or modified. The

matrix that is presented is meant to serve only as a guideline. It is evident that several ongoing PLEC groups have felt free to change these specifications. For instance, in Amazonia, PLEC-Brazil is including students as a new group of participants in demonstration activities. At the estuarine site of Mazagao Velho, the young sons and daughters of local smallholders who are studying at a community-run 'family school' (Escola da Familia) began participating actively in demonstration activities over the last two years. Using the guidelines, other PLEC groups have also rearranged, added and modified many of the activities, roles, and meeting types suggested in Table 1.

**Establishing sites and conducting demonstration activities**

A critical component in planning and executing demonstration activities is the establishment of demonstration sites. Based on a broad range of field experiences, the ideal demonstration sites are those that were set up in the landholdings of selected expert households, but only after establishing a relationship of trust with the householders. Several benefits are gained by initiating a partnership with expert farmers. When this is achieved, members of the field demonstration teams can consult with the farmers on the best location to demonstrate a particular production or management system or technique. Team members can also ask the expert farmer how many demonstration activities can be carried out, at what intervals, how many people may visit their landholdings, and other relevant questions.

Our experience and observations indicate that the varied needs, schedules, and preferences of the expert and participant farmers, need to be taken most seriously into account throughout the process of planning and executing demonstration activities. *In addition, it is recommended that Cluster members consider the agricultural calendar when planning demonstration activities.*

**Use of local gatherings**

There are several forms of local gatherings that we have seen used very successfully to demonstrate particular production systems and conservation practices. Below we discuss a few kinds of gatherings that can be a basis for selecting, planning, executing and monitoring demonstration activities.

***1) Family reunions involving family members***

The expert farmer organizes this kind of demonstration activity. Members of demonstration teams are encouraged to help the farmer organize family reunions and to note the exchange of knowledge between the expert farmer and members of his family. An exchange of seeds, seedlings and other forms of germplasm is expected. In Amazonia a woman expert farmer excels at organizing family reunions and demonstrating her techniques to her relatives, friends and others. Family reunions work very well in this case because she is the most respected member of the household and is highly regarded for her agricultural expertise. Family members consult her on what and when to plant, receive planting materials, get advice on individual problems, and learn specific techniques. Relatives come from several communities located in the region and, upon returning to their communities, further disseminate new ideas and planting materials. Their participation in family reunions has greatly helped to promote the production systems and techniques of the expert farmer beyond her community.

***2) Gatherings of friends and neighbours selected by the expert farmers***

Based on PLEC experiences, organized reunions of friends and neighbours selected by the expert farmers has proved to be one of the most efficient ways to facilitate the exchange of knowledge between expert farmers and other farmers from the community. The role of members of demonstration teams is to urge farmers to hold such gatherings and to note what is

discussed among the participants during demonstration sessions and visits to the fields, fallows, and house gardens of the expert farmer. An example from Amazonia illustrates how to organize demonstration activities for these groups. One of the expert farmers is the pastor of the community evangelical church. Every two or three months, he receives members of his church and other friends at his house. During these gatherings, the expert farmer takes the group to the demonstration sites established in his forests and fallows where he explains management techniques. A member of the PLEC-Amazonia demonstration team records the participants' questions and the answers of the expert farmer.

***3) Working groups***

Results of PLEC demonstration activities show that working groups present the most direct method for expert farmer-to-farmer exchange of knowledge. The informality and social ambience in working groups during particular labour operations facilitates the transfer of production techniques among the participants. The groups are organized by the expert farmers, and participants usually perform some kind of labour for the farmer. After work the expert farmer provides food for them. While or after eating the expert farmer explains his or her production and management techniques. PLEC recommends that the exchange of knowledge be documented through direct observation of the working group in the fields and while the participants are exchanging comments. A member of the team can also make a list of questions and answers during the discussion between the expert farmers and the participant farmers.

***4) Organized training/field visit events***

This type of demonstration activity uses similar methods to the ones used by extension agencies during their training courses. Organization of the activity is under the responsibility of the demonstration team and conducted by the expert farmers. *Based on PLEC experiences, members of demonstration teams should make and use visual aids such as photos, sketches, and posters, to help the expert farmer explain production or management techniques.* In some cases the organization of these demonstration activities can be coordinated with people working in development or conservation programmes. The participation of members from other institutions can also be helpful.

An example of the use of some of these demonstration types in PLEC's Amazonia Cluster is found in Box 2. It is recommended to members of demonstration teams that they provide as much support as possible to the participant farmers. For example, PLEC-Ghana and PLEC-Tanzania often provide transport to the demonstration activities. In the case of Ghana, team members even provide transport for small farmers from other countries in West Africa to visit the demonstration sites established in the landholdings of the expert farmers. Team members organize materials, such as photos of activities, displays of many varieties of a specific crop, and maps of microenvironments. A tutorial visit to the field led by the expert farmer is also included in the activity.

**Special circumstances and special considerations**

One of the achievements of the research components of PLEC from the past years is a strengthened realization that many smallholder systems are essentially different from the ‘scientific’ or ‘modern’ systems that have been embraced by agronomists and promoted by agricultural planners throughout the world. *Many of the smallholder technologies that PLEC groups are demonstrating are long-term multi-stage management systems where fields tend not to go through distinct stages of cropping and fallow, but where management changes year by year, and the exact forms of management tend to be spatially and temporally variable and highly contingent.*

**Box 2 Organizing demonstration activities**

By working closely with the community and observing gatherings where farmers exchange ideas, the PLEC Amazonia Cluster identified several specific approaches to demonstration activities. Initially, the team planned to conduct demonstration activities as part of *encontros*, which are community or inter-community meetings where the conservation of fish and other resources is discussed. Some of the expert farmers were more comfortable sharing their ideas in smaller, less formal groups. Our experts suggested that demonstration activities be conducted using two other forms of social gatherings. The first, called *miutirao*, are shared labour groups organized by members of households to help each other with activities like making fields, planting and other production or management activities. The second type are *visitas*, which are typically gatherings of families or close friends. In all three events expert farmers are the leading figures and are the ones who invite participants to visit demonstration sites.

| *Demonstration activities* | *Number of activities* | *Total participants* | *Average number of participants* |
|---|---|---|---|
| *Encontros* | 10 | 424 | 42 |
| *Miutiraos* | 54 | 1206 | 22 |
| *Visitas* | 34 | 576 | 17 |

Examples of such systems include the very diverse swidden-agroforestry production types central to PLEC-Amazonia's demonstrations at its Macapá sites, as well as many of the agroforestry systems in PLEC-China sites. Demonstrating such production systems is a complex undertaking since at different stages of these multi-phase systems, the variation in management intensity, management techniques, and the resulting production is extreme. Giving a demonstration of only one stage in the production of, for instance, fast-growing timbers in the Amazon floodplain, may not adequately characterize or describe the system. Taking all participants to view examples of all stages of the process may be impractical. This problem tends to arise only when technicians, scientists, or policy-makers are included in the demonstration groups, since local farmers already largely understand the multi-stage processes. Expert-farmer demonstrators may, however, need to be reminded that all members of their audiences are not equally conversant with some of the long-term complexities of the systems.

Another important issue to keep in mind is the value of 'minor', 'peripheral' or 'edge' production types and the need to include these systems in demonstration activities. Although spatially insignificant these agricultural systems can be locally the richest in biodiversity, including agriculturally and nutritionally important plants and animals. Such systems may include edges of swidden fields or bunds between irrigated rice fields, as in northern Thailand, and the agave-dominated 'fences' between upland fields in Mexico or China. Some variants of such systems were also noted at PLEC sites in Tanzania and Kenya. The economic and ecological importance of these systems makes them prime candidates for demonstration activities. In most cases these edge-cropping systems have been overlooked because, besides being small in area, these systems have rarely been significant sources of income. Featuring such systems in demonstration activities may be difficult; their composition is usually highly variable, their management apparently haphazard. Nonetheless, they should get

the recognition they deserve and not be overlooked.

The economic significance of seemingly unimportant 'edge' systems may increase greatly at times of environmental stress, such as flood, drought or pest attack. These offer another special situation or opportunity for demonstration activities. After catastrophic floods along the upper Amazon River in Peru destroyed a large proportion of smallholder production, the PLEC team surveyed the fields and crops that had survived and began speaking with knowledgeable farmers. Some of the management systems, crops, and varieties that had survived became objects of demonstration activities instituted as soon as possible. PLEC team members have to continue to monitor changes and remain flexible in their determination of what is most profitably included in demonstration activities.

**Monitoring the results of demonstration activities**

To further test and develop the PLEC demonstration model, careful monitoring of demonstration activities and the responses of participants is necessary, plus a follow-up on performance after training sessions and demonstration site visits. PLEC members have developed systems to record results for each of the four types of gatherings described. The kind of quantitative information to be reported when demonstration activities are conducted include:

- number of training sessions and visits to demonstration sites per demonstration activity;
- total participants per demonstration activity;
- the average number of people that participate in all demonstration activities.

Monitoring what happens after demonstration activities is most critical for understanding how farmers and other participants are adapting or rejecting the technologies demonstrated by the expert farmers. *The number of people that participate in training sessions and visits to demonstration sites cannot be taken as a measure of the success of the demonstration activity. Information on the number of farmers that are adapting, rejecting or assimilating the technologies is needed.* A great deal of time in the field is necessary for the post-demonstration period. PLEC has several examples that show how farmers modify the production systems and techniques that they learn from the expert farmers. Results from demonstration activities conducted by PLEC-Amazonia show that the majority of farmers do not copy the expert's techniques but rather diversify them (Box 3).

Monitoring teams must be composed of the most experienced researchers who have the highly important field experience, as well as local residents who understand the goals of demonstration activities. The composition of the team may vary in number and specialization. PLEC's teams are composed of researchers, field assistants, union and religious farmer leaders and extensionists. In some cases, as in Peru, the team selects rural teachers to monitor the results of demonstration activities. *Expert farmers should not be part of the monitoring team. PLEC experience shows that some expert farmers do not appreciate the variations made by the participant farmers on the technologies that the expert farmers teach during demonstration activities.*

Although expert farmers cannot be members of monitoring teams, the participation of other farmers is critical. Experienced members and motivated farmers willing to participate are very valuable resources for organizing a team that can document the ways in which farmers assimilate, transform or reject demonstrated technologies. As a means of comparison, the methods demonstrated by the expert farmers must be carefully documented and thoroughly understood by monitoring team members.

**Box 3 Post-activity monitoring**

Many farmers who participated in PLEC Amazonia's demonstration activities in 1999 have begun testing the techniques that they learned from the expert farmers and observed in demonstration sites. We found that smallholders are not copying the agrodiversity and other production and management techniques from the expert farmers. Instead they combine these ideas with their own and create new and original techniques. Farmers tend to incorporate learned production and management technologies only after a long process of experimentation. We found that the trial and error approach employed by farmers to test technologies and crops is increasing the diversity of technologies used through the modification of demonstrated techniques and systems. The table below summarizes the results of post-activity monitoring in Brazil. Researchers from the Brazilian Cluster monitored the incorporation of four techniques presented during demonstration activities into the participants cropping systems.

| Demonstrated techniques | Objective | Recommended techniques | Main adaptations |
|---|---|---|---|
| 1) Agroforestry banana *encapoeirada* system | Managing Moko disease in bananas | *Sororoca* – *pariri* – banana | 1) *açai* – banana<br>2) *fruteiras* – banana<br>3) *madeira* – banana<br>4) combinations of the above with banana |
| 2) Building up soils above tide level | Production of cassava and other crops less tolerant to tidal flooding | Keep sediments and organic matter from eroding during high tides (*lançantes*) using fences | 1) use of logs rather than fences<br>2) placing palm leaves around the highest sections of the field<br>3) accumulation of soils around tree trunks<br>4) accumulation of wood residues from saw mills |
| 3) Enriching fallows | Production of fruits and timber | Thinning and removal of vines | 1) thinning – planting<br>2) removal of vines – broadcasting seeds<br>3) thinning – broadcasting seeds<br>4) combining all the above |
| 4) Managing forests | Production of fruits, timber and medicinals | Removal of vines and formation of gaps (*clareras*) | 1) gaps – broadcasting seed<br>2) removal of vines – transplanting seedlings along trails<br>3) gap formation – managing of seed dispersal during high tide<br>4) combinations of the above techniques |

### *Field assistants*

Field assistants play an integral role in monitoring the results of demonstration activities. Some PLEC Clusters have recruited young farmers for the monitoring team as field assistants. The Amazonian Cluster selected and trained two young field assistants to follow farmers that participated in demonstration activities. The assistants document the adaptation, assimilation or rejection of technologies learned from the expert farmer. These two field assistants have became invaluable members of the monitoring team. Because field assistants need to spend most of their time in the field, they are usually selected from the villages or regions where PLEC operates. Some PLEC

Clusters rely on students as field assistants for monitoring. PLEC experiences show that the sons or daughters of farmers often make excellent field assistants.

PLEC recommends a training period for all field assistants. Training includes sessions with expert farmers and other members of the demonstration teams. Field assistants are required to spend a great deal of time with the expert farmers, and to become familiar with all the production technologies demonstrated. In addition, they need to be trained to perform in-field observations during visits to the landholdings of the participants. It should be made clear that the role of field assistants is not to supervise the participant farmer, but rather to observe adaptation, assimilation or rejection of demonstrated activities.

Farmers and religious leaders can also be helpful components of the team. For instance, in Peru the pastor of an evangelical church is very active in reporting how farmers incorporate production technologies and conservation practices. Community and union leaders of Ipixuna Miranda in Brazil are not only documenting the responses of local farmers to demonstration activities, but they are also reporting how farmers in other regions incorporate the technologies. Periodic meetings with union and religious leaders are necessary to evaluate performances and improve monitoring and documenting techniques.

The monitoring of demonstration activities should include documentation of interactions between the expert farmer and the participants. Information on how the technologies demonstrated are accepted or rejected at the time and later by the different actors is more critical than recording the number of participants in demonstration activities. As is known by most Cluster members, superficial notions of 'participation' do not reveal the socio-political complexity of settings where expert farmers interact with other farmers, technicians and other rural agents. Visits to the participants' landholdings should be included as part of the monitoring process. It is the number of households that are assimilating the technologies that ultimately count towards success.

## Conclusion

PLEC demonstration activities are evolving. The diversity of approaches and strategies employed by PLEC members for conducting demonstration activities, while following the 'farmers-teaching-farmers' approach, are indicative of the developing process. In the short period that PLEC participants have been engaged in demonstration activities, the experience has produced valuable information supporting the PLEC tenet that poor and marginalized small farmers are holders of great knowledge, as well as developers of efficient, effective, and ingenious ways of managing the world's biodiversity.

As members of the Demonstration Advisory Team (DAT) we argue that in the process of technological exchange among small farmers, demonstration activities can be an effective medium with expert farmers as the teachers. PLEC experiences also show that people working in conservation and development programmes will find that, by letting farmers be their teachers, field experiences will become more interesting and challenging. Finally, we are convinced that PLEC-type demonstration activities are a process for progress. Experts can greatly help governmental and non-governmental institutions in their difficult tasks of finding development and conservation initiatives that can reduce poverty and alleviate critical environmental problems.

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# AGRO–BIODIVERSITY CONSERVATION: PRELIMINARY WORK ON *IN SITU* CONSERVATION AND MANAGEMENT OF INDIGENOUS RICE VARIETIES IN THE INTERIOR SAVANNA ZONE OF GHANA

**The late C. Anane-Sakyi[1] and Saa Dittoh[2]**

[1] formerly Savanna Agricultural Research Institute, Manga-Bawku, Ghana
[2] University for Development Studies, Tamale, Ghana

Charles Anane-Sakyi died in 2000, with his work incomplete. This paper is an early report by himself and Saa Dittoh. A longer paper was prepared by Anane-Sakyi, and his Ghanaian colleagues intend to revise and update it for journal publication. The specific work at Gonre that Charles Anane-Sakyi was doing has now been taken over by Dr Paul Tanzubil of the Savanna Research Station at Bawku.

## Introduction

Plant genetic diversity is a key ingredient for sustainable agricultural development for the simple reason that it is what ensures that we move nearer the natural situation. Tropical and subtropical Africa is the centre of diversity for a range of crops such as African rice (*Oryza glaberrima*). African subsistence farmers have traditionally relied on diversity to ensure the stability of their food production systems. Wild resources have continued to be important for food and livelihood security of the rural poor, including women and children, especially in times of stress such as drought, and changing land and water availability or ecological change. The rural poor generally have less access to land, labour and capital and thus need to rely more on the wild diversity available. They have developed diverse land races and cropping practices adapted to local climate, social and cultural situations (M'Mukindia 1994). Unfortunately, when traditional plant materials get replaced by 'high tech' ones, genetic resources are rapidly destroyed. Genetic erosion which is really an economic loss is already hitting small farmers in Africa. There is no doubt that proper conservation of the genetic resources could help development (Norton 1994).

This paper reports the initial stages of work by the PLEC Northern Ghana Group to conserve indigenous rice varieties (IRV) at the farm level. The idea to start this conservation arose from what the authors learned from the women farmers of Gonre. While men farmers had forgotten even the names of indigenous rice varieties, the women of Gonre could name up to 12 indigenous varieties in 1995. Many of them actually continued to cultivate them when the men replaced them with high yielding rice varieties. It is hoped that as more and more indigenous varieties are discovered, conserved and characterized, certain important traits of the varieties will be identified and developed. There is no doubt that conservation will lead to sustainable rice production systems including the improvement and maintenance of soil fertility and eventual increase in income for both women and men farmers.

## Materials and methods

The conservation activity is ongoing at Gonre, one of the three sub-demonstration sites where PLEC work is undertaken in the Bawku area. Gonre falls within the natural Sudan savanna. It is about five kilometres from the Manga Research Station. The area has a large valley bottom for the cultivation of rice. Rural women and men farmers are partners in this participatory action research. About 80 percent of the farmers are women, and a large share of information about the IRV is held by them. The research is particularly unique because rural women in

this part of the country have always been ignored in research and extension work.

In our preliminary work in 1998 and 1999, a participatory technology development (PTD) approach was used. The critical ingredient of that approach is a multidisciplinary research team. Our team consisted of an agricultural engineer, an agricultural economist, an agronomist–soil scientist and an extension officer. Another ingredient of PTD is the use of PRA tools. Using PRA methods, the team sought information about IRV being grown in the valley bottom in the Gonre community. Interviews and discussions were held at the farmers convenience (on the farms, in their homes) and in a relaxed atmosphere. Team members also walked with the farmers in their fields asking for comments and probing for explanations about these IRV. The PTD methodology emphasizes the important role the farmers play. Farmers and researchers operated as colleagues. Indeed, farmers take the driver's seat in the research process, and this was further developed in 2000.

This approach aroused enthusiasm, interest and active participation of the rural farmers who provided information freely and revealed pertinent issues which could have been overlooked by the team.

During the last cropping season much of the time was spent in observing farmers activities and trying to characterize the different varieties. On-farm trials to compare the rice characteristic were undertaken with only 2 IRV and 2 improved varieties. The two IRV**,** *Asamolgu* and *Asakira*, were selected for initial evaluation by eighteen farmers for comparison with some improved rice varieties in the system (IR-24 and GR-18). The plot size was 5m by 5m. The rice was dibbled at 20cm by 20cm and fertilized with mineral fertilizer at a rate of 60–40–40 kg NPK per ha. Basal application was 15–15–15 and later top-dressed with sulphate of ammonia at tillering stage of the rice. Yield and other vital data were collected.

**Results and discussion**

The farmers identified ten IRV grown by them over the years. They gave some properties of these varieties which make them superior to some modern varieties (Table 1). The following qualities were mentioned by the farmers:

1) short cooking time;
2) IRV do not go bad when cooked and left overnight;
3) few ingredients are needed for preparation. Can be cooked with only salt and pepper and will still taste better;
4) they are better for making traditional dishes e.g. *Waakye* (cooked rice and beans together), rice balls etc.;
5) IRV are good for weaning babies;
6) in the field, IRV do not shatter when harvesting is delayed;
7) IRV perform better and give higher yields than improved varieties under low input technology, especially without mineral fertilization;
8) IRV give higher yields under adverse conditions, e.g. during drought, pest and disease incidence;
9) animals prefer the stover of the IRV to that of the improved varieties;
10) IRV are easily processed by the women under local conditions.

**Table 1 Some properties of the indigenous rice varieties (IRV)**

| IRV | MATURITY (Days) | YIELD POTENTIAL (t/ha) |
|---|---|---|
| *Asakira* | 90 | 2.5–3.0 |
| *Asamolgu* | 90 | 2.5–3.0 |
| *Nagamui* | 90 | 2.5–3.0 |
| *Santie* | 90 | 2.5–3.0 |
| *Agonsana* | 90 | 2.5–3.0 |
| *Peter* | 90 | 2.5–3.0 |
| *Abunga* | 115–120 | 3.0–3.5 |
| *Agona* | 115–120 | 3.0–3.5 |
| *Agongula* | 115–120 | 3.0–3.5 |
| *Mr. Moore* | 115–120 | 3.0–3.5 |

This participatory approach to research has clearly indicated the scientific ingenuity that farmers have. Gonre farmers have names for all the IRV. They have names that describe either their origin or their peculiar characteristics. For example, some of the IRV have been named after farmers who first introduced them into the community. Among them are varieties such as *Peter* and *Mr. Moore*. The names of some tell us the origin of the rice. Varieties such as *Agona* originated from a town called Agona in the Ashanti region. Sometimes the size of the grain was used to name the variety. For instance, *Agongula* means short grain rice of Agona. All this tells us that the farmers have a lot of information about the IRV they are growing.

From the on-farm trials it was found that only one of the improved varieties, IR–24, significantly out-yielded the IRV-*Asakira* (Table 2). There was no significant yield difference between GR–18, *Asamolgu*, and *Asakira*. *Asamolgu* even out-yielded GR–18. This showed that the IRV can also give high yields under improved technology such as the use of mineral fertilizer.

**Table 2 Yield of rice on farmers' fields**

| TREATMENT | GRAIN YIELD (THA-1) |
|---|---|
| IR–24 | 3.20 |
| GR–18 | 2.50 |
| *Asamolgu* | 2.90 |
| *Asakira* | 2.50 |
| LSD at 5% | 0.67 |
| C.V (%) | 25.0 |

N = 15 and 18 farmers for the trials in 1998 and 1999 respectively.

## Conclusion

The two IRV *Asamolgu* and *Asakira* have high yield potential and compare well with improved varieties. They also have unique properties that make them preferred by the women farmers. We therefore have continued to work with the women farmers and the community as a whole to promote the sustainable production of these IRV. This recommendation does not imply that only indigenous rice varieties should be promoted but that there is a need to give the farmer wider choices.

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# ACTIVITIES AT THE PLEC SITE AT TUMAM VILLAGE, EAST SEPIK PROVINCE, PAPUA NEW GUINEA, AUGUST 1999 TO OCTOBER 2000

**Bryant Allen[1] and John Sowei[2]**

[1] Senior Fellow, Australian National University, Canberra
[2] PNG Cluster leader, National Research Institute, Boroko, Papua New Guinea

During 1999 and 2000, apart from the day to day activities of research and working with farmers at the Papua New Guinea PLEC site at Tumam and Ngahmbole villages in the East Sepik Province, four notable events took place. First, in August 1999 the sites were visited by the PLEC Demonstration Activities Advisory Team, Miguel Pinedo-Vasquez and Edwin Gyasi. Then in September 1999 the Associate Scientific Coordinator Michael Stocking and Scientific Adviser Geoff Humphries visited. Both groups were accompanied by John Sowei and Bryant Allen. In August 2000, Beretas Minjautehi, a senior expert farmer visited Canberra for three weeks and worked on an historical and genealogical record of group membership and land ownership at Tumam. Finally, in October 2000 a field day was held at the site.

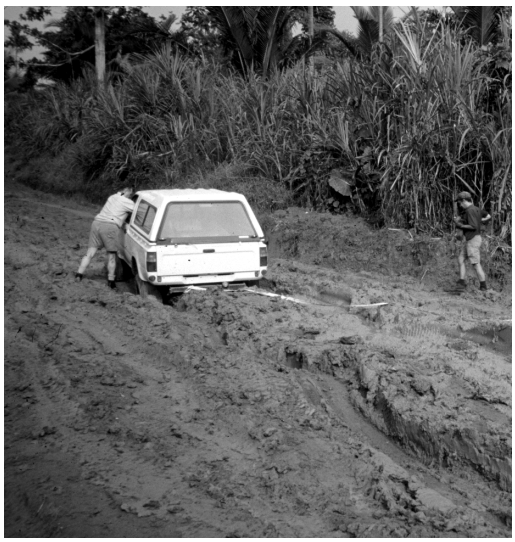

Plate 1 A PLEC vehicle bogged between Maprik and Dreikikir, September 1999

Travel to the site from the international entry point to Papua New Guinea at Port Moresby, involves a two-and-a-half hour flight by Fokker jet aircraft right across the mainland to the northwest coast at Wewak. After over-nighting at Wewak, a 200 km road journey follows, over an often very rough and sometimes difficult road by four-wheel-drive vehicle (Plate 1).

In 1999, before the PLEC field base was fully inhabitable, the visitors stayed in a small house owned by the PNG Institute of Medical Research at Dreikikir, a now largely abandoned government outpost.

Plate 2 Chris Tokomiyer (Field Site Manager), John Sowei (Project Leader), Albert Yulimboh (expert farmer and plant taxonomist), Miguel Pinedo-Vasquez, Edwin Gyasi and Joel Ngemgutu (expert farmer and plant taxonomist) discussing yam cultivars in a garden, Tumam, August 1999

## DAT visit, August 1999

Miguel Pinedo-Vasquez and Edwin Gyasi were taken on an extensive walking tour of the village lands and were able to look at

gardens and fallows of various ages. They were accompanied by a group of expert farmers and Chris Tokomiyer, the PLEC Field Site Manager (Plate 2).

Discussions ranged over a wide number of topics, but included an apparent loss of yam (*Dioscorea*) cultivars as ceremonial exchanges become unimportant; a possible means of conserving remaining forest patches as game animal 'nurseries'; the planting of timber species in gardens at the end of a cultivation cycle; and the extension of PLEC activities into nearby villages. For Edwin Gyasi the yams were very familiar, even if the steep hill slopes were not (see Plate 11). The recent introduction of a West African yam *D. rotundata* was also of interest.

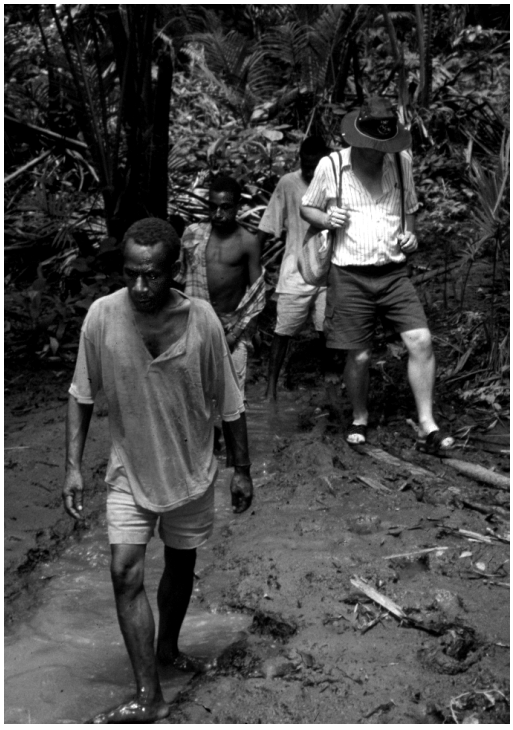

Plate 3 Michael Stocking negotiating a sago swamp, September 1999

**Scientific Coordinator's visit**

Michael Stocking reviewed the scientific programme while Geoff Humphries investigated the possibilities of further work on soil loss during cultivation (Plate 3). The PNG team were able to discuss methodological problems particular to the site, like the small size of fields and the myriad of regrowth patches of different ages and hence stages of recovery.

During this visit, the PLEC field botanist, Dr Stephane McCoy accompanied the team into the village, and remained behind for his second period in the field (Plate 4). During this period he completed the collections at Tumam and also at a site about 30 km to the east at Wosera that is being used as a comparator. However the site is difficult to maintain permanently because of criminal activity. Population densities are three times higher there than at Tumam, and forest degradation is extensive.

These data are presently being entered into the PLEC Agrodiversity Database designed by Kevin Coffey.

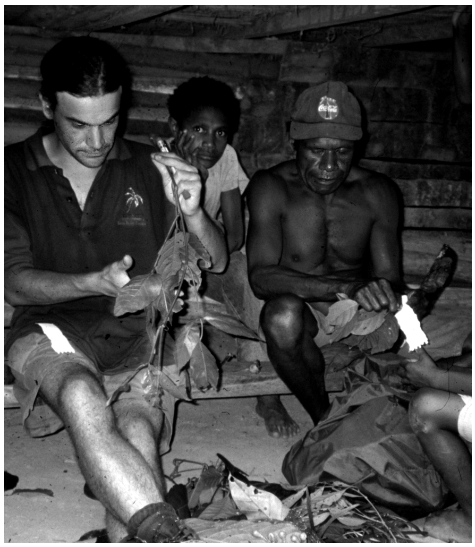

Plate 4 Stephane McCoy and Albert Yulimboh tagging plant specimens after a day's collecting. Most collections were made in fallows of known ages

**Expert farmer's visit to Canberra**

Beretas Minjautehi (Plate 5) is probably over 70 years old. He has clear recollections as a child of about 10 years old, of the 1936 earthquake, when he lay on the ground

terrified, watching the yam he had been eating rolling backwards and forwards. He had been knocked off his feet by the initial shock.

He is acknowledged by the village as an expert farmer, and was the elected Village Councillor for over 20 years. He possesses a prodigious memory of births, deaths and marriages, as well as of group affiliations and occupation of land. Bryant Allen had collected genealogical information to further a study of land tenure and land use in the 1970s. Beretas came to Canberra in August 2000 and assisted Bryant, who had entered the material into a genealogical computer program, to clean the information and to make sense of the way in which his fellow villagers organize themselves and their land.

Plate 5 Beretas Minjautehi, expert farmer, at Tumam during Michael Stocking's visit, September 1999

**Field Day at Tumam, October 2000**

The aim of the field day at Tumam was twofold. First it was to help show PLEC activities to a wider audience outside the sites. Second, it was to reflect back to the farmers in the villages, some of the information they had provided to the PLEC researchers and in particular, to impress upon them, the level of agrodiversity they have in their possession.

The field day was preceded by a one-day Symposium in Wewak, the main town in East Sepik Province. Representatives from the National Agricultural Research Institute (NARI), Research and Conservation Foundation (RCF), representing the Non-Governmental Organizations (NGOs) involved in biodiversity conservation and the Department of Agriculture and Livestock (DAL) Provincial Support Services attended. Two farmer representatives and the Site Manager from the other PLEC PNG site at Ogotana were assisted to travel to the Wewak Symposium and on to the Tumam field day.

The opening address was presented by the Provincial Administrator of the Department of East Sepik on behalf of the Governor He expressed the need for PLEC-related research which generates data and information to support the planning processes at provincial and district levels. He further highlighted the need for impact assessment studies on farming systems and resource management. Development of sustainable agricultural methods was essential to help meet the growing demand for food from an increasing population in both rural and urban areas.

An unplanned outcome of the Symposium was an invitation from the local radio station, Radio Wewak, to Chris Tokomiyer, the PLEC Site Manager and Bansis Morris, an expert farmer, to come back to Wewak and record five radio programmes in Pidgin on the subjects of sustainable agriculture, and the importance of maintaining agrodiversity and biodiversity. These programmes were made with help from John Sowei in November 2000.

The field day consisted of a welcome to the visitors from a women's dance group and then a pre-school children's group, a prayer, and some short speeches from the visitors (Plate 6).


Plate 6 Visitors to the field day at Tumam Village beneath the welcoming banner: Margaret Iori (expert farmer, Ogotana), Pascal Morove (NRI), Inara Bore Site Manager, Ogotana Demonstration Site), Michael Siri (DAL) Kanok Rerkasem (PLEC Regional Adviser, Chiang Mai, Thailand), Chris Tokomiyer (Site Manager, Tumam), Sine Boboro (expert farmer and village leader, Ogotana), Bryant Allen (ANU), Joel Ngemgutu (expert farmer), Abraham Hopotai (expert farmer). The banner reads 'Hrephrepme wah" which broadly translates as 'Environment and Gardens'

Joel Ngemgutu put on an interesting presentation, in which dressed in traditional costume (well almost; his grandparents went about completely naked), he held a digging stick and a spear, a stone axe, a fire stick and some yam and taro tubers and a small banana sucker in a bark carrier (Plate 7). He reminded everyone of how only one generation ago, people depended on the soil and the forest for everything and that the present generation should not forget the great resource of knowledge that was passed onto them by their parents, despite the rapid changes brought about by development.

Beneath a temporary, thatched shelter, the organizing committee had arranged an impressively large range of food species and cultivars, from the main root crops to numerous green leaves, cultivated and collected, and fungi and mushrooms. More than 30 cultivars of *Dioscorea esculenta* were labelled and on display, together with over 20 cultivars of *D. alata*, 25 banana cultivars, and 15 or so *Colocasia* varieties (Plate 8).

Plate 7 Joel Ngemgutu, reminding us of the value of the old ways and of the knowledge of plants and the forest learned from the ancestors

Plate 8 Lusiya Sarewi, holding a *D. alata* cultivar grown exclusively by women. In the foreground are large *Pandanus canoideus* fruits. In the background just a few of the *D. alata* cultivars on display

A number of very large *D. esculenta* tubers were arranged in a container in the fashion of customary exchanges (Plate 9). There was talk that next year, another field day should be based on a full customary exchange. Exchanges have been allowed to lapse, partly because of cultural changes and the introduction of some fundamental Christian sects, and partly because of the amount of hard work involved which younger men are not used to doing.

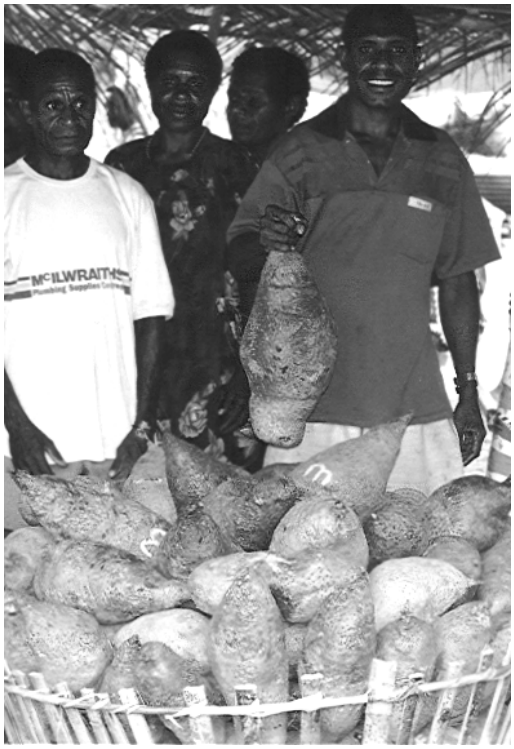


Plate 9 *Discorea esculenta* tubers displayed as for a customary competitive exchange. The tubers are marked with coloured earth to prevent them being surreptitiously returned to the givers

In another part of the same covered area were displayed a number of large posters showing photographs of fallow stages, yam varieties and gardens, air photographs of the village taken between 1939 and 1986 and graphs of population change. The posters created a great deal of attention and were not able to be taken down until it was too dark to see them properly.

The posters were finally retrieved and will be displayed permanently in the PLEC Site House (Plate 10). Now habitable with a gas burner and a rainwater tank, the house accommodated seven visitors with ease. The house is also used by Chris Tokomiyer as an office to maintain PLEC records. It is furnished with a number of chairs, and a small library, donated by a Tumam public servant who was posted out of the province.

Plate 10 The PLEC Demonstration Site house at Tumam

Data collection at Tumam has almost ceased. The final agrodiversity surveys in the third year gardens is being completed, and at Dan Zarin's suggestion, a collection of plants growing along the village edges is being made.

Chris Tokomiyer is mapping all sago plantings. Sago, once a very important food in the period between this year's yam garden planting and the harvest of last year's planting, has been supplemented by *Xanthosoma* taro, new bananas and purchased rice. Sago is interesting because it is planted by one generation and harvested by another. Chris is also undertaking a survey of local hunting, under John Sowei's supervision.

The majority of PLEC work for the PNG Cluster in 2001 will revolve around final data entry and analysis. Analysis will focus on the relationships between population growth, land tenure, social organization and agrodiversity and biodiversity, by looking at change over time, beginning probably around 1920, to the present.

**Expert farmers**

The experts farmers at Tumam range in age from the mid-30s to the mid-50s, with two, Beretas aged 70 and Abraham Hopotai, now

retired, aged in the mid-70s (he was wounded in the foot while carrying supplies for the Australian Army in 1944 near Wewak while in his early-20s).

'Expertise' in farming at Tumam is often equated with a willingness to work hard as well as the possession of particular knowledge. In the past at least, the knowledge of how to get the land to produce was not widely shared, because the produce was used for competitive exchanges and displays and status was dependent on producing more than everyone else. Today however it is not uncommon for a person with 'green-fingers' to help others plant particular cultivars. Even so, when a group of men was asked to classify village farmers into 'good' and 'not-so-good' farmers, their comments were about how hard the 'good' farmers worked, and how the 'not-so-good' farmers were 'lazy'.

The expert farmers have been particularly important in identifying the local names of both cultivated species and fallow regrowth species. Specimens are then formally identified at the Lae Herbarium by Stephane McCoy.

Postscript: Plate 11 is included to remind Edwin Gyasi of just how steep the slopes are at Tumam.

Plate 11 Edwin Gyasi (with stick) climbing a slippery path back to Tumam village, with a little help from Chris Tokomiyer

Small farmers are often viewed as engaging in wasteful practices that wreak ecological havoc. *Exploring Agrodiversity* sets the record straight: small farmers are in fact ingenious and inventive. They engage in a diverse range of land-management strategies, many of them resourcefully geared toward conserving resources, especially soil, and they have shown considerable resilience in the face of major onslaughts against their way of life by outsiders and government.

Using case studies from Africa, Asia, Latin America, and the Pacific, this book provides in-depth analysis of agricultural diversity and explores its history. The book also considers the effect of the "gene revolution" on small farmers and reviews the effects of the "green revolution" in Asian countries. In conclusion, it questions whether the diverse agricultural practices employed by small farmers can survive modern pressures and the global ambitions of the biotechnology industry.

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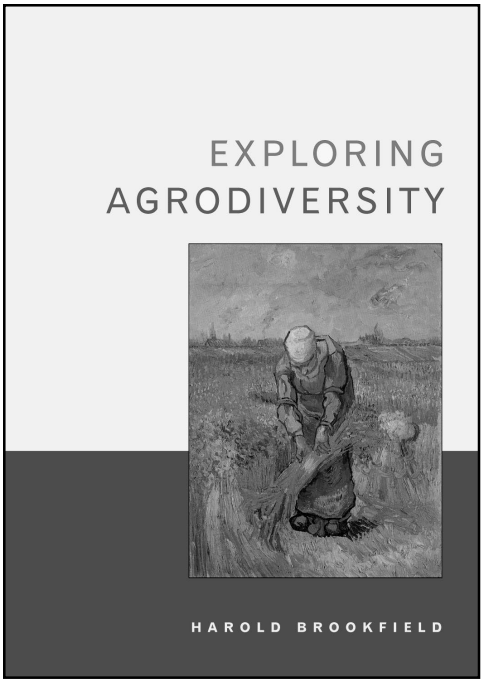


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Harold Brookfield is professor emeritus at the Research School of Pacific and Asian Studies of the Australian National University. Since 1992 he has been principal scientific coordinator of the United Nations University Project on People, Land Management, and Environmental Change (PLEC). He has written several books, including *Land Degradation and Society.*

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- Address: Department of Anthropology, Division of Society and Environment, RSPAS, The Australian National University, Canberra, ACT 0200, Australia
- Phone: +61 (0)2 6125 4688/4348*
- Fax: +61 (0)2 6125 4688/4896*
- e-mail: mbrook@coombs.anu.edu.au
- e-mail: hbrook@coombs.anu.edu.au
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