The United Nations University

PLEC NEWS AND VIEWS

No. 2 – February 1994

A Newsletter of the United Nations University Project of Collaborative Research on Population, Land Management and Environmental Change (PLEC

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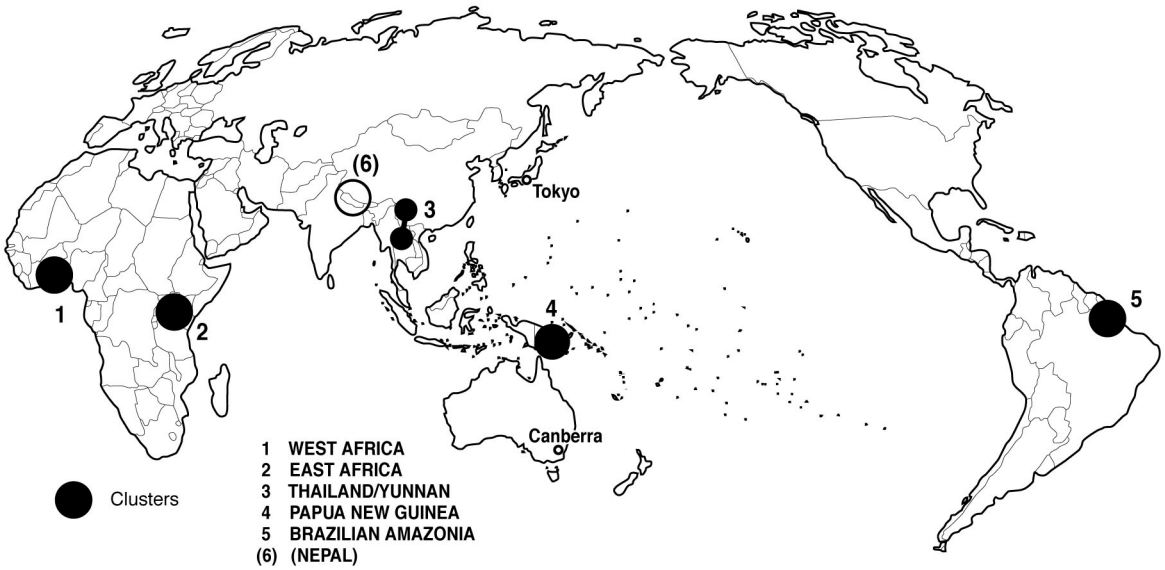

The clusters of PLEC

P L E C N E W S A N D V I E W S **No. 2, FEBRUARY 1994**

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POPULATION, LAND MANAGEMENT AND ENVIRONMENTAL CHANGE (PLEC)

A Short Statement by the Scientific Advisory Group

During and immediately after its recent meeting, SAG, together with the Editor, drew up two short statements about PLEC, designed for two different purposes. The following combines major parts of the two into one. It presents, in many fewer words than the Project Documents, a simple view of what this project is about, and why.

PLEC addresses the question of the interrelationships between population dynamics and environmental change. Contemporary world population growth is especially marked in developing countries. It is reasonable to assume that in these areas there are massive but differential impacts on land use and management. But it is also recognized that simplistic notions of increase of population having a universal damaging effect on the environment do not stand up to scrutiny. Populations and societies adapt, innovate and adjust. PLEC seeks to examine and disaggregate the processses of adaptation of indigenous resource management systems and land use through a series of field-based research projects in key agro-ecological zones of tropical and sub-tropical environments.

Moreover, it is in the developing countries that remaining biodiversity is both greatest, and also under the most imminent threat. Only limited areas of forest can be totally conserved from all interference, and some such areas are encroached upon by people seeking land to farm or log. These human and social demands make it necessary that maintenance of biodiversity has to be accomplished within land use and agricultural systems in which farmers make use of a wide range of both natural and domesticated plant species. PLEC gives emphasis to the study of this **agrodiversity**, which is greatest among small-farming communities in the tropics and sub-tropics. Many farmers use indigenous knowledge and initiative as well as new information, to manage their land, waters and biota for production. Our object is to draw lessons as to which techniques and types of land use best perform the function of protecting natural resources, including the protection of a diversity of gene pools from which tomorrow's innovations may stem. However, too little is known about agrodiversity and, moreover, it is often under threat from development policies which stress monoculture of only a few species, with standard methods of land management. If agrodiversity is forced or allowed to perish, it will have to be re-invented.

PLEC looks beyond descripton. At the core of the research hypothesis is the dynamic nature of the population - environment linkage which affects land management by small farmers, at global, regional and local scales. Socio-economic pressures deriving from within a community or from external sources such as state policies of production or conservation, market demands and tenure arrangements also affect production and resource management. The ultimate aim is to provide researched options for the better management of land and resources for small-scale producers. Effective management systems do not have to be invented only by modern science. They exist, and have been continuously developed by the world's farmers.

PLEC is a network of comparative research projects with broad policy-relevant objectives. These allow local researchers to develop innovative research designs and hypotheses stressing indigenous practices. The five present clusters are in the floodplain of the Amazon, the dynamic grassland/forest ecotone in West Africa, a selection of sites expressing the ecological and population-density range in East Africa, the hill regions of northern Thailand and Yunnan (China), and sites differing sharply in environment and population pressure in Papua New Guinea. Two further clusters are to be added.

THE CHIANG MAI GENERAL PROJECT MEETING
30 May to 3 June 1994

By the kind invitation of the sub-cluster group at Chiang Mai University in Thailand, and especially its leader Dr Kanok Rerkasem, the first general meeting of PLEC will be held there from the **morning of Monday 30 May to the afternoon of Friday 3 June, 1994**. It will open with a day of presentations on the project and its clusters, and the meeting will then become a field meeting for two days. The final two days, attended only by project members and a few invited outsiders, will be devoted to the hard business of developing the plans of the project as a whole, and its clusters, for the three years 1994-1997.

PLEC's financial resources remain limited. Nonetheless, it is essential that there be a meeting of members from all clusters within 1994 in order to ensure that each knows what the others are doing, and that comparable research questions are being asked in all parts of the project. We are therefore committing almost 25 per cent of presently known 1994-95 resources in order to hold this meeting. It will be smaller than we had hoped, but the appreciated readiness to find and use excursion fares, by all those asked to come, enables us to bring enough people together.

Invitees should receive formal invitations from UNU almost as soon as they receive this newsletter. Travel costs as quoted will be paid for all those invited, and they will be paid a sufficient per diem allowance for the necessary period in Chiang Mai. At least for the period of the meeting, the hotel will be paid directly by UNU, so this allowance will cover only meals and incidentals. Necessary additional nights and stopover nights in Bangkok will be reimbursed, where they are necessary, at the full per diem rate.

We hope that some others might be able to attend, but it is not likely that we shall be able to offer any support. The meeting will be accommodated at the Holiday Garden Hotel, near the University, where the room rate is Thai Baht 625 (presently about US$ 25) per night, single. There are many other hotels and guesthouses in Chiang Mai, with a wide range of prices, but we will not be able to provide transport except at the conference hotel. It will be hot, and the opening period of the rainy season, in Chiang Mai at the end of May. Light clothing should therefore be brought, but field clothes and tougher shoes (or light boots) for the field trip. The excursion will take us to higher altitudes but no more than a light sweater should be needed, if at all. Formal attire will not be required. An umbrella or light raincoat is advised. Also strongly advised is **anti-malarial medication**. Further details are available from the local organizer, Dr Kanok Rerkasem, Agricultural Systems Programme, Faculty of Agriculture, Chiang Mai University, Chiang Mai 50002, Thailand. His fax is +66-53 210 000 and, unlike some others in the PLEC network, it works very well. He also has e-mail, the address of which is <kanok@cmu.chiangmai.ac.th>

All formal arrangements will be made from Tokyo, by the Administrative Coordinator (Dr Juha Uitto) and the financial controller, Ms Audrey Yuse. Programme arrangements will be made between Harold Brookfield and Kanok Rerkasem, and will be advised to all involved in good time.

FROM THE EDITOR: PLEC NEWS

HALF A YEAR OF PROGRESS AND UNCERTAINTY

Progress

During the seven months since *PLEC News and Views* No.1 appeared, the project has taken considerable steps forward. In August, two major applications for funding were completed and despatched during a visit to Tokyo by Brookfield. The Amazonian cluster held its first major meeting in the same month of August, and a Scientific Advisory Group (SAG) of three people was formed. It is described below. An early decision was to seek cluster plans in two stages, first a set of pre-proposals that we could review by January, and then a set of fuller proposals by April. The purpose was both to seek comparability in the work being proposed, and more importantly to ensure that all the work being proposed corresponded with the central objectives of PLEC.

In September an East African cluster was initiated, and held its first meeting in December. The Thailand/Yunnan cluster held a second meeting at the beginning of November. Almost all groups prepared proposals on their research by the due date, in time for the January meeting of SAG.

At the end of 1993 most of the initial 'seed' contracts expired, and reports were due in. Most were received by mid-January and the small UNU funding then provides small new contracts to run to mid-1994 so as to facilitate the development of detailed plans. Notwithstanding the delay in getting access to larger funds, reported below, SAG endorsed the plan to hold a general meeting at the end of May. By that time it will be almost two years since the initial steps were taken at the small Washington meeting in August 1992, and it is essential to bring a few members of all clusters together to discuss detailed proposals and their harmonization.

Activity in the clusters up to now is rather uneven in nature. Two groups have carried out specific research tasks and reported on them at length, in one case with only the seed funding provided by PLEC. In another, although individuals and small groups within the cluster have progressed substantially with their work, the main cluster activity, as such, has been a conference. Others have used funds and time mainly to conduct preliminary planning work, carrying development of proposals a considerable way forward. In the next few months, between now and the Chiang Mai meeting, some groups will continue ongoing research, but it is important that all develop integrated proposals that address the main project questions. The small 'interim' contracts now being offered are designed principally to cover the costs of so doing, although specific small research costs are also covered.

A Setback

We have, however, had one loss. The cluster in Nepal was one of those which used its seed funding to give additional support to its already-funded research. Because the project concerned, directed by the overseas participants, would soon approach its concluding stages, a decision was taken in mid-year to transfer full leadership to Nepal; this decision was reinforced when Kasperson (the leader) became Provost of his University, while his colleague Turner was increasingly involved in work as Co-chair of the Global Land Use and Cover Change project of IGBP and HDP. Just as the change was about to be made, in October, a bombshell dropped. The designated new leader, the research director of ICIMOD in Kathmandu (Dr Jodha), was offered and accepted a post in the Environment Department of the World Bank in Washington, and has taken this up in January 1994. No alternative leadership had

been developed. A small holding proposal has been prepared for discussion at the Chiang Mai meeting. However, Brookfield and Jodha met in Kathmandu in November and had to agree that the Nepal cluster, as it was originally designed, has become unviable. PLEC, having two months earlier grown from five clusters to six with the formation of the group in East Africa, promptly fell back to five. For the moment, no action is being taken on a replacement.

Uncertainties

The reason for withholding action is the continuing uncertainty over project funding. The two applications made in early August, after several months of preparation, were sent to the United Nations Population Fund (UNFPA), and to the United Nations Environment Programme (UNEP) for the Global Environmental Facility (GEF). On the basis of its evaluation of an earlier draft, UNEP had offered to sponsor us for the latter. The UNFPA application is still under 'technical review' at the time of writing, and we fear it may have been overtaken by other developments leading up to the World Population Conference this September. Some changes were made to the UNEP application during a visit by Brookfield to Nairobi at the start of September, and it was submitted by UNEP to the Scientific and Technical Advisory Panel (STAP) of the GEF. STAP had a number of questions, especially about project methodology and the relation to biodiversity. It seems we came quite close, but not close enough to make it in one leap. A revised draft and some other documentation were prepared in October with a view to resubmission to STAP in January. However, the January meeting of STAP was cancelled. Further discussions are in progress in February and March. Fortunately for our short-term future, UNU has demonstrated confidence by more than doubling its former direct contribution to the project in the 1994-95 biennium, but resources remain tight.

Regional Funding and Co-funding: a 'Catch-22' Situation

Both these applications were for the project as a whole, covering both its central and networking activities, and making provision for co-funding of cluster research with other donors, specific to clusters. Although 48 per cent of the funding requested was for support of cluster research and internal networking, the sums sought were not envisaged as being sufficient to cover all the needs of (five, ultimately seven) clusters, none of which had at that time formulated detailed plans. We envisaged an average partial-support-level of US$35,000 per year per cluster for the first three years, but with provision to raise this to around US$50,000 per year for some clusters that had greater need and put up the best proposals. Clusters with good co-funding of their own, or with only smaller-scale proposals, would receive less. As detailed plans are now being formulated it is clear that most clusters will need more substantial sums to carry out ambitious plans.

Serious investigation of co-funding at a regional level is therefore now starting and, if our whole-project plans cannot adequately be funded, we may have to look for multiple co-funding arrangements for the central activities of the project as well. Now that we have a clearer view of project development this can be undertaken around a basis of real plans in the coming few months. There is, however, a difficulty. PLEC finds itself in something of a 'Catch-22' situation. We need stronger administrative support, and opportunity for lobbying, to have good chance of success in a fair number of co-funding applications. But preparatory funds we had hoped to receive have been withheld for reasons outside the control of our friends. We therefore lack adequate money to provide administrative support or fund the opportunity to lobby foundations personally. Even the personnel available is inadequate. In Canberra, it consists only of the Scientific Coordinator, who is not full-time. While he now has some grant-supported research aid (from Australian sources), he still works without any administrative or secretarial support except, under contract, for the production of this Newsletter. At UNU in Tokyo, our personnel

support involves not more than about ten per cent of the working time of the Administrative Coordinator and financial controller, who have to look after many other projects and meetings, as well as ourselves. It is important that these constraints are understood.

They may not be insuperable, but they do consititute a real difficulty. Brookfield did a lot of project travel in 1993, with some good results, but hopes to spend more of 1994 at his desk. The gaps in management time which arose in 1993 (a main reason for two months' delay in publishing this second Newsletter) may therefore be less of a problem. The project is getting some good publicity, and the first issue of *PLEC News and Views* was very well received. The mailing list has, as a result, grown much larger. Brookfield, members of the SAG and some cluster leaders, are working on increasing project publicity, but this takes time to achieve results. Although everyone continues to make preparations to move quickly, we may have to advance more slowly than originally hoped. There is, however, progress, and we look for more. And there is certainly progress in the clusters, more fully described between pages 10 and 18.

Management and Monitoring of PLEC

A Major Development

With the growth of the project and its wide intercontinental spread, some sharing of the leadership load already seemed necessary by March 1993, when formation of the cluster in Ghana brought the number up to five. It was then suggested that a 'steering committee' should be formed. Circulation of cluster leaders produced near-unanimity that a formal steering committee might do more harm than good, but that an advisory group formed from within the project could be of great value. As briefly mentioned in *PLEC News and Views* No. 1, it was agreed in July that a 'Scientific Advisory Group' (called SAG, which is what it does not do) be formed, each covering a specific area of expertise, and with active or potential interest in one or more of the project's cluster areas. By agreement, cluster leaders were not included in this group. Its job would be to advise within the areas of specialism and in general, help in setting up and monitoring clusters (one of those appointed had already done this, informally, in late 1992), and share with the Scientific Coordinator the job of making decisions on both project direction and cluster directions The intention is that, during the life of the project, all of them will visit all clusters. This depends on funds that we still do not have, but meantime some travel planned for the Scientific Coordinator may be done by one or more SAG members instead.

The group quickly proved its value. In East Africa, where two earlier unsuccessful attempts to set up a cluster had been made, a potential leader was soon identified. The SAG member involved was able to attend the first meeting of that cluster in December. Another gave advice which led to the two-stage review of cluster proposals. The third was able to attend one critical cluster meeting, being in the same country on a different project at the appropriate time. She is also in close touch with another cluster, and has been instrumental in generating a proposal, still in its early stages, which may lead to one replacement for our loss in Nepal.

The group as a whole met at the least-cost point of mutual travel, in San Francisco, for three days over New Year, and covered a great deal of project business in a short time. A short report has been sent to all clusters, and a summary appears below. The SAG is now kept fully informed on project business and, because Brookfield and two of its members already have e-mail and the third will have when she returns from the field to her home base, communication between us is – most of the time – quick and easy.

Although Brookfield continues to communicate with all clusters, there is already some spread of responsibilities. This will be particularly helpful when messages are urgent. Difficulties continue to arise in cases where there is little or no overlap in working hours between Canberra and places on the other side of the world. So many organizations still turn their fax machines off at night!

THE COORDINATORS AND THE SCIENTIFIC ADVISORY GROUP

This seems the time and place to tell more about the group which is now involved, in different ways, in central project management. There follow brief biographical statements about the two Coordinators, the Scientific Advisors and the Financial Controller. The order is alphabetical.

HAROLD BROOKFIELD, Scientific Co-ordinator of PLEC, is University Fellow in the Research School of Pacific and Asian Studies, The Australian National University, where he was Professor of Human Geography before formal retirement in 1991. He was one of the first of many social scientists to work in Mauritius, in the mid-1950s. After joining the Australian National University in 1957, he began a long-term programme of research on agriculture, land tenure, and social and commercial change, among the Chimbu of the central highlands of Papua New Guinea, continuing almost every year until 1970. From the early-1960s he also worked in other western Pacific countries, especially Vanuatu. During a period in Canada, at McGill University from 1970 to 1974, he began research in both the West Indies and Malaysia, but in the latter year returned to the Pacific to lead a two-year pilot interdisciplinary Man and the Biosphere project in eastern Fiji, for UNESCO. Later, he led another and smaller UNESCO-MAB project in the eastern Caribbean. Since the late 1970s, and especially since returning to Canberra in 1982, his principal research has lain in Southeast Asia, mainly in Malaysia. From the early 1960s onward he has contributed to theoretical debate on the study of indigenous farming systems, agricultural intensification, and its correlates, and on development both in general and in rural areas in particular. A conviction that such work must be based in sound knowledge of the natural environment has led to intermittent forays into climatic analysis, and to studies of the management of land resources and their degradation, which have fed directly into PLEC. He has undertaken work for several international bodies, including UNESCO, the World Bank, the Asian Development Bank, the International Board for Soil Research and Management (IBSRAM), UNDP, UNU, UNEP and the EEC, in Fiji, the Caribbean, Malaysia, Nepal, Indonesia and the Pacific islands . He is author, co-author, editor or co-editor of over 175 articles, chapters in books, notes, reports, monographs, and 16 books.

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JANET MOMSEN, the project's specialist on gender issues in particular, is Professor of Geography at the University of California, Davis. She is also Chair of the Graduate Program on International Agricultural Development, and Co-director of the Gender and Global Issues Program on campus. Outside the University, she is Chairperson of the International Geographical Union's Commission on Gender and Geography which has almost 400 members in over 50 countries. Before going to Davis in 1991 she was at the University of Newcastle on Tyne in England, and before that at the University of Calgary, in Canada. She has also taught at the Federal University of Rio de Janeiro, the Interamerican Institute for Agricultural Sciences, Turialba, Costa Rica, the University of Leeds (U.K.) and the University of London. Her main interests are in agricultural development and gender. She has field research experience in the Caribbean (where she did her doctoral research), Brazil, Central America, West Africa and China. She has been a consultant/advisor to USAID and ODA and to various national agencies. This has involved working with small farmers developing agrodiversity, the marketing of new products and alternative rural income sources such as tourism. In addition to over 80 scientific papers and reports, she is author or editor of six books on topics such as gender and

development, Brazilian development and Caribbean agriculture.

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CHRISTINE PADOCH is an ecological anthropologist by training (Columbia University, PhD 1978). She holds the position of Scientist in the Institute of Economic Botany, New York Botanical Garden, Bronx, New York. She has carried out research on management of forests, agro-forests and agricultural fields by traditional peoples in several areas of the humid tropics. After initial research in Guatemala, she spent three years in Sarawak, East Malaysia, studying Iban shifting cultivators, and another year in East Kalimantan, Indonesian Borneo, investigating upland- and irrigated-rice cultivation by the Lun Dayeh. From 1982 to 1987 she worked in the Peruvian Amazon on patterns of agriculture and agroforestry in the Ucayali river floodplain, and on trade in forest and agricultural products around Iquitos. Since 1990 she has been engaged in a programme of research on forest management and changes in agricultural patterns in Tara'n Dayak communities of West Kalimantan, Indonesia, and since 1992 also on resource management in the lower Amazon floodplain in Brazil where she is spending most of the year 1993-94. Much of her recent fieldwork has been done as a member of inter-disciplinary and international teams of researchers. Her conviction that the diversity and dynamics of traditional resource management practices and their effects, particularly on biodiversity, deserve far more intensive study, has also involved her in work as advisor to U.S. and international institutions, including the U.S. Man and the Biosphere Program, the Smithsonian Institution, the National Research Council and UNEP. She is the author of more than 40 monographs, papers and book chapters, and is co-editor of five books and editor of the monograph series *Advances in Economic Botany*. She taught in the University of Wisconsin, Madison, before joining the New York Botanical Garden.

From about August 1994, her fax number is +1-718-220-1029. E-mail: *ieb@nybg.org* [not at present direct]. Postal address: Institute of Economic Botany, New York Botanical Garden, Bronx, NY 10458-5126, U.S.A. Until then she is living in Macapá, Brazil.

MICHAEL STOCKING, specialist on the management of land resources, especially soils, is Reader in Natural Resource Development in the School of Development Studies, University of East Anglia, Norwich, U.K., and is immediate past Dean of the School. He has been involved in tropical agricultural development, land resources and soil conservation since 1969. His main research and consulting experience is in the sustainable use of resources, through appropriate development of conservation practices adapted to local farming systems and socio-economic conditions. With long field experience in several parts of Sub-Saharan Africa (especially Zimbabwe, Kenya and Tanzania), Brazil, South and Southeast Asia, his work involves erosion monitoring, soils investigation and the relationship between soil loss and vegetation productivity. Agroforestry, intercropping and multiple land use feature in his work, along with the development of projects aimed at encouraging local people to protect forest reserves and national parks. Currently, he is engaged with the UN Food and Agriculture Organization to work on the integration of environmental themes into agricultural extension and education. He has been an advisor/consultant to FAO/UNDP, UNEP, the World Bank, IUCN, IIED, ODA, SIDA, SADC and national agencies. As a member of the Conservation Committee of WWF-UK, he advises on a range of development and conservation issues. Training is a key component of his experience, with courses offered in agriculture, resource assessment and management, and environmental issues. He is the author of over 100 scientific papers, books, book chapters and reports.

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JUHA UITTO, Administrative Coordinator of the project in the United Nations University, is a geographer with an MSc from the University of Helsinki in his native Finland, and a PhD from the University of Lund in Sweden. His research work focuses on population processes and regional development, and rural development strategies with emphasis on eastern Africa. From 1984 to 1987 he worked at the International Fund for Agricultural Development (IFAD) on the monitoring and evaluation of rural development projects, and socio-economic analysis. He then joined the Scandinavian Institute for African Studies. Research, and consultancy work for Scandinavian bilateral and multilateral aid agencies, have taken him frequently to Sub-Saharan Africa and Asia. Since 1990, Uitto has worked at UNU as Academic Officer, in charge of the University's research and training programmes in the field of environment, implemented through inter-national networks of scholars. In particular, his duties relate to activities pertaining to the Human Dimensions of Global Environmental Change. He has published more than 30 articles and reviews in scientific journals, scientific reports, books and monographs, as well as chapters in books.

AUDREY YUSE, the financial controller for PLEC, is a Programme and Administrative Officer in the Academic Division of the United Nations University. She is a graduate of the University of Hong Kong, where she developed interests in social welfare and undertook community work. She joined the UNU in Tokyo in 1976, and has since worked with the University's programme divisions, including the Human and Social Development Programme, the Development Studies Division, and now the Academic Division. Her main experience lies in programme budget management and monitoring, financial planning and control, as well as contract administration. The scope of her work includes a great many multi-disciplinary projects supported by UNU through its world-wide networks of institutions and scientists.

Both Audrey and Juha can be reached at the following postal address: United Nations University, 53-70 Jingumae, 5-chome, Shibuya-ku, Tokyo 150, Japan. Tel: +81-3 3499 2811. Fax: +81-3 3499 2828.

E-mail: use this number by Internet: *program%jpnunu00.bitnet@pucc.princeton.edu* [Note that in '*jpnunu00*' the last two digits are numerical zeros].

In the next issue of PLEC News and Views*, and possibly in the fourth as well, we propose to print similar brief biographies of the project's cluster and sub-cluster leaders. All will be asked well in time to provide copy.*

The San Francisco Meeting of SAG

This meeting, held in a pleasant old hotel in central San Francisco, began on New Year's Eve 1993 and ended on 2 January 1994. We discussed the budget and its problems, and then reviewed the documentation of the project, especially regarding its methodology. Two short statements, combined into one statement and printed on page 1 of this Newsletter, were drafted, beginning on the first day. The whole of the second day was spent in reviewing pre-proposals received from the clusters, or individuals within them. We had comments on all these proposals, some minor and some more substantial, and each cluster was written to individually after the meeting. On the third day we turned to a range of issues, especially the organization of the General Meeting, and a minimum list of invitees to provide basically-adequate representation within the limited budget available. We also drew up a reserve list, and suggested an order of business. We discussed project publicity, and the need to keep it active and lively.

We also considered the nature of a replacement for the Nepal cluster. Given that there will be no replacement until more funding is available, so that all that is presently available can be used for the remaining five groups, we felt that selection of further clusters should be very deliberate, choosing environmental, population and developmental conditions that are not adequately represented in the present set. Something like a matrix was suggested, to be considered when we meet in Chiang Mai. One partly worked-out

possibility in the Caribbean was presented, where high population density with limited resources, and some important management contrasts between different islands, could provide a useful addition to PLEC's present sites. Other potential areas discussed included Indonesia and Bangladesh. We also took note of the small holding proposal from ICIMOD in Nepal, designed to keep the connexion with PLEC alive. Contact with UNEP in Nairobi was also established by telephone during the meeting.

We discussed the proposed field meetings. SAG stressed that attendance at these should rotate among cluster personnel, so that others beside cluster leaders would have advantage of the networking opportunity provided. Since UNU is proposing that PLEC be well represented in some of its other meetings in 1994-95, some cluster leaders are likely to have chances to meet, and it is of great importance that other project members also get together.

This was a brisk meeting, successful as well as enjoyable. It was broken only briefly late on New Year's Eve, in order to celebrate the advent of what we hope will be a prosperous year for the project.

SPECIAL ANNOUNCEMENT

A PLEC Special Number of *Global Environmental Change*

Several months ago, the Administrative Coordinator Juha Uitto proposed that the UNU-sponsored journal, *Global Environmental Change: Human and Policy Dimensions*, might have one 1994 number devoted to PLEC. The purpose is to present the work of the project in its context, by means of formal journal articles ranging in length between 3,000 and about 6,000 words. With a shift in editorship of this journal from U.S.A. to England in progress in 1993, we received the new editor's provisional agreement only in November. This was finally confirmed by the journal's editorial committee in January 1994. In view of the rather long delay in obtaining this decision, we can now aim only for an issue in May/June 1995. The publishers, Butterworth-Heinemann, require that fully refereed and edited copy must be in their hands in early January in order to achieve May/June 1995 publication. The following schedule has been established.

Papers will be first edited by Brookfield (with some help from SAG members and others). All papers will be peer-refereed.. The schedule is tight, as the whole manuscript must be in the hands of the journal editors in Oxford, England, for their final editorial work, by 16 December 1994. **It is therefore necessary that all manuscripts, completed and referenced according to the journal style-sheet, of which a copy will be sent to all authors, be delivered to Brookfield to reach him by Monday 4 July 1994.** Where changes are required, editorially and/or on the advice of referees, revised manuscripts must reach Brookfield not later than **Monday 14 November**. Most papers are being invited, but PLEC members in general are asked by this announcement to consider if any others wish to offer papers. Any who do should please send titles and short abstracts to Brookfield, to reach him by **4 April**. Brookfield's postal address, fax and e-mail numbers, appear in this Newsletter in the section entitled 'The Coordinators and the Scientific Advisors', and also on the back cover.

REPORTS FROM THE CLUSTERS

Reports on the clusters in this issue are unequal in length and nature, both because there have been wide differences in the nature of activities in recent months, and also because cluster reporting has been in different forms. The first, which comprises a substantive report on a pilot research task, is the longest.

WEST AFRICA

The West African cluster, at this preparatory stage based entirely in Ghana, was formed in March 1993 and quickly set up a pilot programme of research. This was completed and reported by 15 January 1994. An article for the special number of *Global Environmental Change* will be based on this report. The cluster has prepared a detailed pre-proposal for its future work, some aspects of which are still under discussion after comments offered by SAG. During a period of about six months from February to July 1994, Dr Gyasi, the leader, is a Visitor in the Department of Geography at the University of Canterbury, Christchurch, New Zealand. Dr Elizabeth Ardayfio-Schandorf is acting as cluster leader during this period. Membership of the cluster remains as listed in *PLEC News and Views* No. 1.

A short article by Dr Ardayfio-Schandorf appears in the section on Short Papers, Notes and Views, at pp.19-21.

The Ghana Report: a Summary

The Ghana group has conducted a substantial pilot project in an area inland of Accra. There follows a brief summary of this research, drawn (without figures, tables or references) from the extensive report entitled *ENVIRONMENTAL ENDANGERMENT IN THE FOREST-SAVANNA ZONE OF SOUTHERN GHANA, by E.A. Gyasi, G.T. Agyepong, E. Ardayfio-Schandorf, L. Enu-Kwesi, J.S. Nabila and E. Owusu-Bennoah with the assistance of S.K. Kufogbe and technical advice by G. Benneh. (University of Ghana, Legon).*

Introduction

The rural forest-savanna transition zone of southern Ghana, the southern side of which covers approximately 6,200 km^2, is a sort of ecological buffer between the dry coastal savanna and the interior humid forest. It is characterized by a 1,260 mm mean annual bi-modal rainfall, generally adequate to support two crops, and by a prevalence of ochrosols which, like most of the other fairly varied soils, are suitable both for perennial tree crops and annual tree crops. Within it, however, the population, presently estimated at about one million, is increasing as is the land usage, and a mosaic of forest-savanna vegetation is expanding at the expense of the thick deciduous forest which predominated in the past.

The region has considerable diversity in farming systems, land holding arrangements, and crops. This relatively high agrodiversity reflects the transitional character of the ecosystems, permitting use of crops adapted both to humid and drier conditions, and to the ethnic and associated cultural diversity, strongly affected by migration. The zone is a major producer of food crops, notably cassava (manioc), maize (corn) and vegetables, for the nearby coastal urban areas. Ghana's population is still growing at an annual rate of 3 per cent.

The study drew on available literature, and on data from field work focused on environmental perceptions, adjustment strategies, and the range of options available to a mixture of owner and tenant farmers including migrants. We used 1960-1993 as the main study time frame. In-depth field study concentrated at three sites between 60 and 120 km inland by road from Accra. The

sites were inhabited before or from the year 1910, when the cocoa revolution in Ghana was well underway. They represent areas occupied by both the original Akuapem and the Ayigbe/Ewe, Krobo and other migrant farmers, both owners and tenants.

The field study was carried out on a team basis among the interdisciplinary research group by rapid rural appraisal, and more deliberate methods in October, 1993. Work included focused group discussions facilitated by the use of a written guide and a cassette recorder; questionnaire and non-questionnaire interviewing of a sample of agricultural household heads, as well as government officials and NGO members; ground transect measurements, quadrat sampling and visual observations of relevant environmental parameters along 4-5 km of path line at the study sites; and survey of commodity types sold at rural markets in the study area, and of the destination of the commodities. We also drew on laboratory, statistical and other techniques, and upon various ideas concerning the evaluation of sustainability and unsustainability for the data analysis and discussion.

The three study sites, Yensiso, Amanase and Sekesua, show varying stages of land cover and use change from deciduous forest to perennial tree crops and arable crops. After rapid increases since the 1960s, population densities in 1989 ranged from 105 to 178 per km^2, and we estimate an average of 161 per km^2 for the whole forest-savanna zone. In the three study areas together, 54.5 per cent of the land was in active cultivation.

A Summary of Some Environmental Findings

Most farms were inter-cropped, with cassava and maize as dominants. Relict cocoa farms occurred under broken canopy tree cover. Several plots were reported to have been cropped almost continuously since about 1950 when Ayigbe/Ewe migrants reportedly started renting land from the Akuapem owners for food crops. The continuous cropping had led to noticeable soil impoverishment and decreased crop yields in spite of the use of artificial chemical fertilizer and improved crop varieties. Home gardens fertilized with household refuse constituted a fairly significant proportion of actively cultivated land around the villages. The proportion of the total area covered by fallows was 34.3 per cent in Yensiso, 34.8 per cent in Amanase, and 41.7 per cent in Sekesua, with the average fallow ranging from one to two years. We estimate the area in fallow, farms and other uses to be over 90 per cent of the total land area.

It is evident that farming and other land uses have displaced very nearly all the original natural forest, and threaten to eliminate the rest. We found only scattered representatives of species typical of what was apparently virtually-closed high forest, so described as recently as 1960. Also, a considerable number of the traditional crops were reported by the local farmers to be extinct or in the process of extinction. With few tall trees, herbaceous and shrub species occupy the most space, and among these there is a preponderance of species of the families Compositae, Gramineae and Euphorbiaceae. The Compositae comprised seven species, outstandingly *Chromolaena odorata* which was found everywhere in dense impenetrable masses, particularly in fallow lands. This is a particularly prolific plant associated with deforestation, and was commonly regarded as a primary noxious weed that is next to impossible to eradicate. Once *C. odorata* arrives at a locality, its incredible morphology and high competitiveness enable it to out-compete, outgrow and thus exclude all other species from its immediate milieu. There is also a number of other invasive herbaceous species, including *Canna indica* and *Imperata cylindrica* together with several others.

A major consequence of deforestation has been deterioration of the soils and their structure by erosion, desiccation, compaction and other degradational processes with negative implications for fertility and productivity. We analyzed the physical and chemical properties of soils sampled along the transects. The particle size analysis showed that, with the exception of naturally-sandy Amanase, cultivation and cropping generally decreased the sand contents in the topsoils while the clay contents were increased, giving

rise to sandy clay loam to sandy clay texture. The increase in fine fractions observed in the topsoil of the cultivated soils might have caused clogging of the macropores, and hence the uncontrolled erosion observed in the farms.

Soil pH decreased with cultivation in all the soils because of the leaching of bases. Again with exceptions, there was a gradual decrease in the exchangeable cations and the cation exchange capacity (CEC) during the cultivation and cropping period due to leaching and crop uptake. In general the results showed that the CEC decreased because of decreases in pH. The organic carbon of the soils varied from 4.5% to 2.2% (average 2.7%), whereas the organic C contents of the exposed cultivated soils varied from 2.8% to 0.8% (average 1.7%), a drop of appproximately 37 per cent. Total N and P followed the same trend as that of the organic C. The decline in total N and P in the cultivated soil may be associated with increased erosion losses. Soils under fallow between two and four years had significant contents of these two elements.

The Role of *Chromolaena odorata*

Chromolaena odorata (in some parts of the world still called by its older name *Eupatorium odoratum*) is regarded as a noxious weed, and it certainly increases fire risk in the dry season, when it dries out and provides a large mass of fuel. It is, however, a potential source of fuel energy for domestic use, and our laboratory analysis confirmed the local farmers' claim that it improves soil fertility once it gets established as the predominant species in a fallow land. Soil pH tended to increase with fallow under *C. odorata*. The effect of *C. odorata* in increasing the basic cations is dramatic, particularly the exchangeable Ca and CEC contents in the fallow soils. The improved contents of organic C, and of total N and P under fallow (particularly *C. odorata* fallow) for a relatively short period, may dispel the notion that fertility is not regenerated under a fallow of between two and three years. However, further studies are needed to confirm this, and to determine the proper management of *C. odorata* in the farming system. We are proposing such research.

Forces Bearing on the Problem

The increase in the absolute numbers of people is a major source of stress on the environment through the farming and extractive activities. On the basis of the 1970-1984 growth rates, some village populations are likely to more than double by the year 2000. Depopulation of some heavily degraded areas is likely to continue, and at present the farming systems lack corrective means for the reclamation of such areas. As the quality of the environment declines, so do yields, earnings and living standards. It is not surprising therefore that 25 per cent of the households could no longer adequately feed themselves with the produce from their farms. Significantly the figure for Amanase, which showed the highest population growth rate among all the villages surveyed, was 45 per cent.

But this is not all. Demand also originates from rural and urban areas within the country itself, and from outside the country. We carried out a number of surveys to gauge this demand on our study areas On the whole, food items, especially unprocessed crops led by cassava, comprised nearly 91 per cent of the commodities sold in three markets, while about 9 per cent consisted of other items including firewood and charcoal. On average, moreover, 91 per cent of the commodities were destined for the urban settlements, most especially Accra-Tema, Ghana's largest urban area. In the past much of the production pressure placed on this zone originated from outside Ghana, rather than within the country. It took the the form of external demand for primary agricultural and forest products, notably cocoa and timber.

Ability of the Farming Systems to Cope

Before about 1850, most of the present forest-savanna zone consisted of virtually uninhabited virgin high forest owned largely by Akyem people. Elsewhere, including the Akuapem hill areas which already supplied food, palm oil and bush-meat to the coastal

settlements, was a low-impact economy based upon hunting, gathering and shifting food crop cultivation. From about 1850, pressure on the uninhabited forest areas increased substantially due to the migration by Krobo and Akuapem farmers in search of more land, initially for the production of palm oil and kernels from both wild and cultivated palms. The oil palm expansion lasted up to about 1900 when the cocoa expansion began, with both events facilitated by the 'company' system of group purchase of land called *huza* by the Krobo people who initiated it. Cultivation of palms and cocoa closely mimicked the forest ecosystem by the integration of food crops under and among trees and shrubs. Nonetheless, it had allelopathic effects on the forest ecosystem by widespread replacement of the ground storey.

From the 1930s, cocoa farming was devasted by the swollen shoot disease. Since that time, disturbance has grown far worse by a shift to cassava which, being tolerant of low soil fertility, has continued to expand as degradation has proceeded. Among household heads surveyed, cassava as dominant crop is followed by maize. Subsidiary crops include plantain, cocoyam (taro) and yam, and the vegetables pepper, tomato and garden egg (egg plant). Some crops, most notably cocoa, yam and cocoyam which thrive in humid forest environments, had ceased to be grown by some of the farmers since 1960. Only 12 per cent of those operating the generally old cocoa farms had attempted to rehabilitate them.

Now, however, some farmers are incorporating new crops led by the bean, a leguminous plant, and the vegetables garden egg and tomato, followed by cassava, maize and pepper. The high crop biodiversity (over 20 main cultivars) thus represents a transition which still includes some traditional humid forest crops together with cassava and maize, and is now augmented by a less dramatic but nonetheless significant shift toward vegetables and legumes.

Declining yields, however, are common. One measure of the high frequency of cropping is the cultivation period, which generally ranges from one to over five years. Another is the common fallow of one to four years which is considered inadequate for soil fertility regeneration in Ghana, unless accompanied by artificial soil improvement measures such as chemical fertilizer application, agroforestry, manuring and mulching, which are practised only to a limited extent. A third measure is the permanent cropping practised by 18 per cent of the farmers, especially in the backyard, but with only limited application of artificial soil fertility regeneration techniques.

Cultivation methods and tenurial relations are further problems. The hoe, used by Ayigbe/Ewe migrant tenant farmers, appears less selective in the removal of natural flora, and of the seed stock in the soil, than the cutlass culture of the other ethnic groups. Monoculture, with all its risks, is practised by 8 per cent of the farmers. Among the localities where the environmental problems appear worst are the denuded Kokormu grasslands heavily farmed by the Ayigbe/Ewe migrant settler tenants. It appears a major factor compelling these and other tenants to over-exploit the land by the hoe, fire, and cultivation of cassava (either alone or in combination with maize), is the seemingly usurious sharecropping and land renting arrangements. Typically, one-third or even half of the maize and cassava go to the landowner. Then in some *huza* areas of the migrant Adangbe people, the production capacity of the farming land appears to be undermined by the inheritance system, whereby the land is progressively sub-divided among the succeeding generations. For these and other reasons, difficulties in land acquisition are reported by 24 per cent of the farmers. From all the preceding analysis, it is clear that the farming system has to modify, if environmental endangerment is to be reversed.

Views of the Farmers

We discussed these issues with some 200 people, including chiefs, and both elderly and youthful men and women. On the whole, the discussions revealed a popular awareness of the problem and some possible solutions. They also revealed a general willingness to participate in corrective programmes. We obtained a similar set of results from our questionnaires. There is no space to detail

everything that emerged, but there were unexpected additions such as reduction in the snail population and extinction of wild mushrooms. It was pointed out that the firewood shortage is reflected in the growing use of cassava sticks, palm fronds, corn stocks and cobs, and twigs of *C. odorata* and other small shrubs as substitutes. Above all, however, was concern over declining crop yields. Causes which deserve urgent attention include the poverty associated with the large population and high cost of living, which compels the over-cultivation of the land, over-exploitation of the resources of the forest, and the dying out of traditional agroforestry. Some of these aspects are further developed in Elizabeth Ardayfio-Schandorf's short paper printed below (p. 19).

Acknowledgements

We wish to acknowledge, with profound gratitude, the assistance of Dr. A.A. Oteng-Yeboah (Head, Department of Botany, University of Ghana) in the Yensiso area field study. We are equally grateful to the farmers and the other rural folk for their co-operation in the field.

EAST AFRICA

The cluster in East Africa has been formed only since *PLEC News and Views* No.1 was published. Initial contact with the present leader was made in July, and Brookfield was able to visit him, and two of his colleagues, in Nairobi in early September while working with UNEP. Although UNU set up the necessary initial contract with all possible speed, the cluster was still not fully formed in December when a first meeting was held, attended by Dr Michael Stocking both as a member of SAG and as a possible cluster participant in undetermined capacity. Plans to extend into Uganda and Tanzania have since taken a useful step forward, so that the cluster membership in February 1994 is as follows:

Romano M. Kiome, (Cluster Leader), soil science, land management (Kenya Agricultural Research Institute, Nairobi, Kenya)

Loise Wambuguh, socioeconomics of land management (Kenya Agricultural Research Institute, Nairobi, Kenya)

David N. Mungai, soil-climate-crop relationships (Geography Department, University of Nairobi, Nairobi, Kenya)

Elois A. Ayiemba, demography (Geography Department, University of Nairobi, Nairobi, Kenya)

Francis Kahembwe, conservation, forestry and development (National Agricultural Research Centre, Kampala, Uganda)

Joy Tumuhairwe, farming systems and soil conservation (Geography Department, Makerere University, Kampala, Uganda)

Fidelis Kaihura, soil science and land management (Tanzanian Soil Survey, Mlingano, Tanga, Tanzania)

Michael Stocking (Advisory Member), resource management, soil science (University of East Anglia, Norwich, England)

The address of the cluster leader is: Dr R.M. Kiome, A/Deputy Director, Kenya Agricultural Research Institute, National Agricultural Research Laboratories, P.O. Box 14733, Nairobi, Kenya. Fax [working hours only]: +254-2 444 144.

The Cluster has been active during its short life. In mid-December, before the meeting, the four Kenya members of the cluster undertook a three-day excursion in Kiambu, Embu and Laikipia Districts in order to examine agricultural and associated problems. Land use and land management were particularly observed, with a focus on the very rapid changes taking place under high population growth, and commercialization with generally quick response to market conditions. However, soil and water conservation were seen generally as poor, with particular inefficiency in the use of both rainfall and irrigation water. Regulations designed to restrict farming on steep slopes, and keep it away from river banks, are widely flouted. Although there are some classic examples of land degradation, depletion of biodiversity is more clearly visible than degradation of soils in some areas. In the mainly-dry Laikipia District, on the leeward side of Mt Kenya, the population growth rate has been estimated as

high as 8 per cent annually, even though male out-migration is common.

Research questions were identified and, together with questions that arise in Uganda and Tanzania, will be built into the cluster plan now under preparation. Particular problems identified during the excursion included: (a) the extent and degree of land degradation; (b) implications of migration, and the integration of migrants, for resource management; (c) productivity of the present farming systems and its response to rising demand; (d) the range of available production technologies, and gaps in knowledge of these in the grazing areas in particular; (e) the perception by farmers of the state of their resources, and of the problem of unsustainability.

In particular, the group proposes to examine how far the relatively optimistic findings in the recent study of Machakos District in Kenya (M. Tiffen, M. Mortimore and K. Gichuki, 1994, *More People: Less Erosion*, Chichester, John Wiley), are applicable to other East African areas.

NORTHERN THAILAND AND SOUTHERN YUNNAN

This trans-national cluster, the membership of which has changed slightly from that reported in *PLEC News and Views* No.1, is now well established. Its activities have been geared principally to the setting up of collaborative arrangements between the group in Chiang Mai, Thailand, and in Kunming and Xishuangbanna, Yunnan. Two meetings have been held, both (especially the second) involving field visits to prospective working sites.

The Chiang Mai group has been enlarged to include:

Jamree Pitakwong, social science (Agricultural Systems Programme).

The Kunming group no longer includes Hu Gang or Gao Lishi (although they remain interested). Pei Shengji, still in Nepal, is no longer listed. However, the group has been enlarged to include:

Liu Aiqing, botany, population policy (Kunming Institute of Botany)
Zhou Juqian, environmental analysis (Yunnan Institute of Geography)
Feng Yan, topographical analysis (Yunnan Institute of Geography)
Xu Zaifu, biodiversity (Director, Xishuangbanna Tropical Botanical Garden, Menlun, Xishuangbanna)

The first meeting was held in Chiang Mai in July 1993, and was attended by 11 participants (including all cluster members and some others) from Chiang Mai, plus five MS students, and 5 cluster members from China. Cluster presentations were made providing a general background of the member institutes and their intended activities relating to PLEC. The Kunming Institute of Botany presentation provided a summary of recent work on traditional (indigenous) agroforestry systems which are currently practised by the major ethnic minorities Population pressure, market forces, the role of alternative crops and land use intensity were discussed in relation to shifts in government policy on land allocation and tenure. The Chiang Mai presentation was devoted to the historical development of shifting cultivation among ethnic minorities in the upper northern region of Thailand, where the majority of the hilltribes live. Government policies on opium eradication, social and economic integration, forest protection and land degradation were reviewed. Rapid changes from rotational shifting agriculture to permanent agriculture were discussed in relation to sustainable or unsustainable outcomes. Efforts of government and non-government agencies to rehabilitate upland forested areas were summarized.

The group then discussed key issues under the following headings:

- External/internal pressures on land use, and farming system changes;
- Social transformation, local adaptation and institutional arrangements;
- Outcome of land use and farming system changes, and system responses, in both Thailand and Yunnan.

The group identified a number of key variables which would allow for comparative studies in the future. They included:

- Marginal uplands as a focus area to include swidden ecosystems, agroforestry systems, natural forests and other land uses;
- Ethnic groups to be studied. Priority was given to Akha (Hani), and Lisu or Lahu;
- Target agroecosystems, including in Yunnan: agroforestry systems, swiddens, homegardens and protected areas. In Thailand: agroforestry systems, swiddens, permanent fields and rehabilitated lands.

The group went on to identify a collaborative village system analysis as a joint activity. This would serve as methodology training for members, would promote technical exchange, would gain regional perspective and encourage joint research planning. A village would be selected in each country to serve as a pilot field study, and preliminary work would begin about March 1994.

There was a GIS demonstration, then a one-day field excursion to a highland village 35 km from Chiang Mai. This was a Hmong village established since the early 1960s, which has grown from an original 20 households to 130. The rotational period in shifting cultivation has been reduced, and there is conversion of swiddens to commercial fruit trees and coffee. However, the expansion of cabbage as a cash crop has led to expansion of agriculture into adjacent forest, leading to water problems in the dry season. The group talked with villagers and visited their fields.

The second meeting was held in Kunming in November 1993. It was attended by 10 people from Kunming (plus a few others from time to time), two from Thailand, by Brookfield and, for part of the time, by Momsen who was in Yunnan working with another project. It was preceded by a field excursion attended by Kanok Rerkasem and Rampaiphun Apitchatponchai from Chiang Mai, and followed by one attended by Brookfield. The meeting was opened by Brookfield, then followed by cluster presentations reviewing the work done in both Thailand and Yunnan since July. It was noted that most upland villages have moved their sites since 1960, mainly because of water shortages and to facilitiate a shift from upland- to wet-rice. However, extensive migration has continued, especially into Thailand from neighbouring countries because of poverty, political intervention, and for commercial reasons. A series of papers was presented by the Yunnan participants, with translation into English for benefit of the visitors.

Comparative discussion focused on the elements that are comparable between the Thailand and Yunnan situations. There are also differences, in land/watershed policy, different pressures on land management, indigenous knowledge and approaches to its application, lowland/highland interaction, and in the nature of projects. The process of commercialization is of a different order and nature. All this must be appreciated in order to set compartive work in context. A set of common or related questions was drawn up within the principal question of the search for environmentally sustainable and economically advantageous systems of production under growing pressures. They included:

- Among the many land-, crop-, water-, woodland- and forest- management practices identified among the hill farmers, which are sustainable, which are of utility in degraded land, and which can most readily be incorporated into agroecosystems by resource-poor farmers?
- Is the present wide range of practices identified in Yunnan, and the smaller range identified in Thailand, wholly or principally a survival from the past, or is there still active and continuing development and diffusion?
- Especially where practices are modern, or are extending in area, how are innovative practices developed or received and adopted by farmers? How are indigenous developments transferred between farmers, especially in different ethnic groups?
- What are the social, demographic, economic and political conditions most conducive to wider adoption, invention or retention of conservationist practices, and what are the conditions that have led in the past, and still lead, to severe resource degradation.

It was agreed that research should employ the agroecosystem method, but with specific attention paid to the details of agroecosystem elements, especially innovative elements, within the systems. It was further agreed to endorse the plan made in July, to commence

with one pilot community in each region during 1994.

The field trips were each of three days' duration, based at Xishuangbanna Tropical Botanical Garden, and visting a number of villages. Emphasis was placed on whole agroecosystems and on agroforestry practices. The territory of one village (Mamoe, Hani [in China] or Ahka [in Thailand]) was explored in some detail, and two Jinuo and two Dai villages were visited more briefly. It was noted that there is considerable variation in the physical evidence of land degradation between different parts of Xishuangbanna.

Since the meeting, both groups have prepared detailed plans and they to be combined into a single, but two-part, document to form the basis with which to seek co-funding for a three-year programme.

PAPUA NEW GUINEA

This group, like that in the Amazon next discussed, has continued with already-funded research, and the direct relevance to PLEC appears more in the design of new activities than in the ongoing programmes. This applies especially to the Australian members and their Papua New Guinea colleagues who are substantially funded by Australian aid (AIDAB) to survey, describe, classify and map the farming systems of the whole country, an overdue task as described by Allen in *PLEC News and Views* No.1. Agricultural systems are being distinguished on the basis of six criteria: type of vegetation cleared before cultivation; length of the non-cultivation period; the staple crops; segregation of crops within and between gardens (which exhibits substantial variation between different regions); and the use of special techniques, other than fallow, to maintain soil fertility. The long term purpose is to examine levels of agricultural intensity against existing or additional data on the natural envronment, social, economic and demographic measures, in order to identify areas already or incipiently subject to stress and degradation. Field work is now complete over some three-quarters of the country, and Working Papers covering system descriptions for four Provinces have been published in 1993. Several Papua New Guinea junior field scientists have participated in this work, which will now incorporate biogeographical study of the fallow (or post-cultivation) succession, by Dr Graham Sem of the University of Papua New Guinea.

The Japanese group has continued a programme of case studies in selected locations, focusing on interrelationships between land-use systems, agricultural activities, food and nutrition, and demography. Two lowland and one highland group were studied before 1993 when, after discussion with Australian colleagues and in the light of the objectives of PLEC, new work was initiated in two highland areas and on one small island. The strongest focus is in the high-density Huli region of the Southern Highlands where two Japanese graduate students are now in the field, and where two Australian graduate students have lately completed field research. Several papers of relevance to PLEC have been published.

The seed money provided by PLEC has been used for three meetings, one in Canberra and two in the field in Papua New Guinea, both involving significant field work. Interrelated plans have been prepared for comparative study of relationships between environmental conditions, land management, agricultural technology and productivity, and relevant socio-economic conditions including demography, migration, human nutrition and disease. These will be conducted in three highland and three lowland areas at different stages of incorporation into the national and global economies. All have been visited by members of the cluster, and the main field work will be carried out by graduate students. An integrated research proposal, by the whole cluster, has been prepared on this basis and commented upon by SAG.

The most significant membership change is that Dr Graham Sem of the University of Papua New Guinea will in future share in joint cluster leadership. Other membership has been enlarged somewhat by the addition in Japan of:

K. Suda, anthropology (Hokkai-Gakuen University)
M. Nakazawa, human ecology (University of Tokyo) and

T. Kawabe, anthropology (Takasaki College of Economics)

Three Tokyo graduate students, M. Umekazi, T. Yamauchi and S. Odani (all human ecology), and two ANU graduate students, C. Ballard (prehistory) and K. Benediktssonn (human geography) are now formally associated with the cluster. Simon Haberle (paleoecology) has completed his doctorate and, after working for the team for a few months, has now joined the Smithsonian Tropical Research Institute in Panama.

AMAZONIAN BRAZIL

This cluster is alone in concentrating on a single though greatly varied physical region, the floodplain of the Amazon, or *várzea*. Apart from that part of the Papua New Guinea work which is concerned with wetland areas at low altitude, its work is presently PLEC's only activity in a floodplain environment, where water- as well as land-resources are of major importance. As described in an article at pp. 25-26 below, the particular interest of the region lies in its growing perceived status as 'the next economic frontier in northern South America on the basis of food production'. In fact, floodplain agriculture has a long history, and great agrodiversity. Its present relatively small population is, however, for the most part impoverished, and while ecological sustainability, except of the fisheries, is not immediately endangered, socio-economic sustainability is seriously threatened.

The principal activity of this cluster as a whole has been a three-day workshop on the utilization of the *várzea* by small farmers, held in Belém in August 1993 and chaired throughout by the cluster leader, Dr E. Adilson Serrao. The objectives were to identify limiting factors for sustainable agricultural and forestry development, discuss case studies, identify methodologies, determine key criteria for site selection, and identify institutions and persons who might participate in the cluster. Twenty-five persons were invited and almost 50 attended, many of them from government institutions in Belém. Including a presentation on PLEC by Brookfield (the only presentation in English), 11 papers were presented and discussed. There was a short field excursion. The papers covered many aspects of resource use in the *várzea* and its waters, and there was lively discussion. As a conference on the *várzea* it was successful and informative, bringing together a substantial body of work for the first time in one place. Because there was so full a programme, however, there was limited time for discussion of cluster plans, or its membership.

The two pre-proposals that came to SAG in San Francisco were therefore separate. A proposal based on their on-going programme on sustainable resource management in the tidal section of the floodplain (described by Hiraoka in *PLEC News and Views* No.1) was offered by Mário Hiraoka, Christine Padoch and Miguel Pinedo-Vásquez. This research project which has two principal sites, one on the north bank of the lower Amazon and one in the estuary, has been active in 1993 with all the principals spending periods of months in the field. The second proposal, by David (Toby) McGrath of the Federal University of Pará in Belém, concerns management of both water and land resources in an area near Santarém where over-fishing of the lakes has created serious problems which the riparian farmers are seeking in different ways to manage. An abstract of a paper by McGrath, delivered in Belém, is printed below on page 27. SAG agreed that his proposal should be supported, while the participants work out their relationship within an overall design.

In January 1994 it was proposed that McGrath become 'assistant executive leader' to Serrao, that Erick Fernandes be deleted from the cluster list, and that Deborah Lima Ayres, Federal University of Pará (Anthropology) be invited to participate. A set of outline plans drawn up has not yet been discussed either by SAG or by the cluster as a whole. They will be elaborated before the time of the Chiang Mai meeting.

SHORT PAPERS, NOTES AND VIEWS

Shortage of time, described above, has made impossible the inclusion of an editorial paper on methodology or sustainability, as intended. This section therefore consists of three contributed short papers, together with three abstracts of papers offered at the Belém meeting of the Amazonian cluster. Short papers (up to c.1,800 words) are sometimes sought, and offers are always welcome from project members. In future issues of PLEC News and Views we may be able to print more than on this occasion.

WOMEN AS FARMERS IN GHANA

by
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Introduction

The Rio Declaration (Principle 21) stated that women have a vital role in environmental management and development and that their full participation is, therefore, essential to achieving sustainable development. This statement is in recognition of the important roles women already play in environmental management (and have done for many years), and the need to embark on action toward equitable treatment of women in all endeavours, including farming. In Africa, more than in other developing regions, women contribute up to three-fourths of the labour required to produce the food consumed. Aggregate data, though rough, indicate that African women provide about 90 per cent of labour used in processing food crops, providing household water and collecting fuelwood, and a similar part of that engaged in growing food crops. The Ghana situation to some extent reflects this common experience.

In Ghana, farming has always been a major activity of rural women. Their contribution is a key factor in the agricultural economy. They work as farm owners, farm partners and farm labourers. They are responsible for subsistence crop production to feed the family, and for cash crops (defined in terms of agricultural commodities in international trade). Women dominate more in agricultural activities in the southern sections of the country than in the north. Their operations also extend to post-harvesting activities, transportation, food processing and preservation and, more importantly, to the marketing and distribution of food crops. In this paper, studies of women farmers will form the point of departure for discussion within the context of the Government's structural adjustment programme, its constraints, and also in the context of environmental degradation or endangerment.

Women Farmers

Ghanaian women farmers in the south of the country are recognized as being farmers *par excellence*. In a survey I conducted in six villages in the Eastern Region of Ghana in 1988, the 204 rural women interviewed through a systematic sample survey were all farmers. Out of this number, 75 per cent undertook farming as their major occupation, while for 25 per cent it was a secondary occupation. The labour of most of these women was allocated to household subsistence and, in contrast, the men devoted their time to cash-crop or commercial farming, and to investment in capital-intensive activities.

Of all the women farmers interviewed, 95 per cent of the major farmers were engaged in food-crop production and only 5 per cent in cash crops. As feeders of the household, women's concentration on food production is influenced by opportunity costs. With

subsistence agriculture, women are assured of food for feeding the family. At the same time, cash from the sale of their farm surplus is used for the purchase of non-consumables and for the care of their children. Differences can also be seen in the farm size worked by women. Where women operate cash-crop farms, their farms are smaller than those of the men, ranging mostly between 0.4 and 0.8 ha. Though it could be argued that child bearing and rearing, and domestic functions, reduce the time and energy available for women to expand their farms, there are other and more pertinent issues. In all the farming households, women are employed as cheap family labour on the cocoa farms because of the high cost and scarcity of hired labour.

Commercialization and Setbacks

Agricultural commercialization and cash-crop farming have increased the workload of women farmers, making their task more burdensome, time-consuming and laborious. For, in addition to assisting on family cash-crop farms, they are solely responsible for the preparation, processing and storage of the food crops. On some of the commercial farms they work jointly with their husbands, or work on the farms of relations. Some are employed as daily labourers.

With the adoption of 'structural adjustment' by the Government of Ghana, greater emphasis is being placed on exportable crops. Men who grow these crops appropriate many of the basic inputs which the women need. Thus the women lack critical inputs such as capital, land and labour to operate on a larger scale. This increases the difficulty of the woman farmer's job, narrowing down opportunities to generate a reasonable marketable surplus. In addition, cutbacks in government spending on social services (due to the structural adjustment programme) bring a great deal of hardship to increasing numbers of women farmers in poor households, who depend on the market for wage labour and food.

Environmental Management

In spite of all the technical setbacks mentioned above, women farmers are more worried about the productivity of crops, which has been falling as a result of environmental degradation. They have noticed tremendous changes in the natural environment of their farming activities since the 1960s. Formerly they could cultivate more varied and nutritious food crops. Now, crops like yams, which do better on good soils, have had to give way to cassava which is better able to thrive on impoverished soils. Similarly, environmental degradation is evidenced by fuelwood scarcity, requiring women to walk longer distances to collect fuelwood, to cut off young shoots before maturity and over-farm the forest areas. Extensive tracts, including river valleys, have been deforested over as much as a 20 kilometre radius from their homes. Erosion and evaporation have also increased, just as the stability and productivity of the land are threatened, leading to reduced incomes for women and other family members. The women suggested provision of job opportunities, afforestation and reforestation, access to inputs such as fertilizers, training skills, credit and extension services.

Conclusion

Though women are concerned with lack of access to farming resources, their main concern is the need for proper environmental management, through the introduction of agroforestry, afforestation, reforestation and appropriate management of the land. Such a call from women farmers indicates their commitment as key actors in the farming process. In order to achieve sustainable development, in the spirit of the Rio Declaration, there is a need to identify women's environmental-management needs in relation to those of all farmers. This will assist in planning and implementing a more sustainable farming system for them and their communities.

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DECIPHERING LAND USE HISTORY FROM HILL SLOPES: AN EXAMPLE FROM NEW GUINEA

by
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Attempts to assess the potential sustainability of land management systems seem to be based on the premise that if current practices are suited to the environment, then the system should also be sustainable for as long as the pre-determined boundary conditions remain valid. This appears to be an underlying assumption of a recent, but still evolving, approach to sustainability evaluation being developed by an international group of soil scientists and agriculturalists.[1] However, attempts to undertake this type of evaluation will be thwarted unless attention is directed to the history of land use practices at the chosen sites. For instance, whether or not the condition of a patch of land is the result of 50 years or 500 years of cultivation should be a vital issue for sustainability evaluation.

Determining land use histories before the recent past requires input from various disciplines engaged in archaeological and palaeo-environmental research. In the highlands of New Guinea this type of work has focused on sites where depositional records are best preserved, such as lakes, swamps, caves and rock shelters. Information from these records allows comments to be made about the site and the surrounding area provided that a strong regional signal is contained in the deposit. At the Kuk archaeological site in the Wahgi valley of the central highlands, for example, an excellent record of agricultural land use history has been derived from a swamp deposit. This record reveals a complex history of ditching that presumably was undertaken to drain the very fertile organic sediments (e.g. Golson, 1977). However, to explain phenomena such as periodic swamp abandonment and changes in the rate and style of sedimentation, it is necessary to make some inferences about conditions in the catchment which feeds the swamp (e.g. Hughes *et al*., 1991; Bayliss-Smith and Golson, 1992). Sound as this approach may appear, in fact a swamp-based study is incapable of distinguishing variations in the extent and type of land use change within different parts of the contributing catchment at the level of detail required for land evaluation purposes. Similar constraints apply to hillside archaeological sites in rock shelters and caves (e.g. Gillieson *et al*., 1987); for these settings are focal points of human activity and can hardly be representative of conditions in the surrounding landscape, either at the time of occupation or during occupational hiatuses.

Given these deficiencies, attention has been directed to seeking depositional sites on hill slopes that do not suffer the same restrictions as cave and rock shelters. Such open-archaeological sites exist on hill slopes that are, or have been, subjected to cultivation. Before considering this further, it is useful to reflect on the nature of erosion on hill slopes in these humid tropical uplands. Under dense forest little sediment transport

[1] Known as the 'Framework for Evaluating Sustainable Land Management' (FESLM) (Dumanski and Smyth, 1993), it is based largely on the FAO's Framework for Land Evaluation.

occurs, except in areas subjected to frequent mass movement.[2] With the advent of forest clearance, and especially after burning and tillage, bare soil is exposed to rainwash (= rain splash + slope wash + sediment rafting). This change in the erosional regime can result in the transport of considerable amounts of soil. Erosion of this type can be witnessed during rainfall events on recently tilled soil, and it has been measured under experimental conditions from microplots and garden plots (Humphreys and Wayi, 1990). Further evidence of the net effect of rainwash can be seen in the development of various types of deposits such as litter dams and microterraces (Mitchell and Humphreys, 1987, p. 355) and others familiar to the geomorphologist. At breaks in slope, small talus cones or aprons composed of soil aggregates (rather than gravel as portrayed in textbooks) often develop. At the end of shallow drains on gentle to moderate slopes small alluvial fans commonly form. In addition, soil aggregates collect behind obstacles, such as tree buttresses or logs, positioned across the slope. The most important of these is the build up of soil behind fences at the bottom of gardens. Of particular significance are those semi-permanent fences consisting of living plants, usually described by their New Guinea Pidgin names, such as 'yar' (*Casuarina* sp.) and 'tanket' (*Cordyline fruticosa*). The latter plant is very useful as it propagates vegetatively enabling the fence to be maintained as an effective bio-engineering structure (c.f. Clark and Howell, 1992). In this situation considerable volumes of soil accumulate to form a rampart of sediment which has a surface slope less than that of the hill slope (Figure 1). Recently, Humphreys and Brookfield (1991: 310-302) used the term *talud* for this feature – a word derived from old French.[3]

The development of a *talud* (Figure 2) commences when the first barrier is placed across a slope. In this instance it is portrayed as consisting of 'tanket' but this does not need to be the case. Soil trapped by the fence, together with erosion of the sediment-starved zone downslope of the fence, generate new surfaces (i.e. S_0 - S_1 - S_2). This results in a thicker topsoil layer upslope of the fence and an eroding topsoil downslope of it. In many places the topsoil immediately downslope of the *talud* has been removed exposing underlying subsoil (Figure 1b).

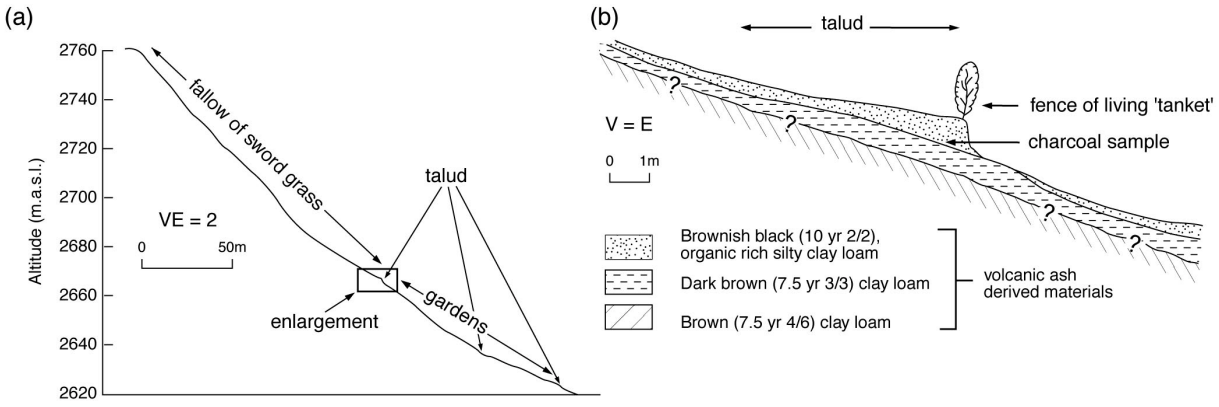
In the Chimbu valley of the central New Guinea highlands, farmers often plant stems of 'tanket' into the new surface once 20-40cm of 'new' soil has accumulated. This is seen as a conservation measure to maintain the fence and enhance its soil retention capabilities. In places, up to 3 distinct generations of 'tanket' lines have been detected, with the most recent stems 2-3cm in diameter and the oldest about 10cm in diameter. It is also common for the fence, including individual stems, to bend downslope 50cm or more so that the profile closely resembles the classic soil creep curve (see Humphreys and Brookfield, 1991: Figure 7b). However, this feature results from the weight of the accumulating soil deposited by rainwash rather than by creep.

Apart from soil aggregates *talud*s can be expected to contain dateable organic materials. A common cultivation practice in the highlands is to burn the vegetation refuse after clearing in preparation for tillage. This provides copious amounts of charcoal and organic fragments which are transported from the slope and trapped at the *talud*. An additional source of organic detritus is provided by small cooking fires located on the *talud* surface at times of garden weeding and harvesting as people take advantage of the

[2] Protection from erosion is provided by a thick mat of bryophytes that blankets the surface and trunks of living and fallen trees. Under these conditions the rate of natural erosion is <60 mm/1000y (or 0.5 tonnes/ha/y), as calculated from the preservation of a volcanic ash mantle >50,000 years old which persists on stable uplands (Humphreys, 1984). Mass movement is not ubiquitous but favours particular lithologies in this humid region of moderate seismicity.

[3] In England the term '*lynchet*' is sometimes used for this type of feature (e.g. Catt, 1986: 101), though there is a tradition of using it in a broader sense (e.g. Wood, 1961; Smith, 1975) to include ramparts of soil that have built up as footslope deposits without the trapping effect of fences or other barriers. In this sense a *talud* could be considered as a particular variety of lynchet.

Figure 1: a) Transect along fallow and garden land with *talud*s. Upper Chimbu valley. b) Enlargement of a *talud*



gentler slope and the shade provided by 'tanket'.[4]

The development of *talud*s represents a history of land use. By dating the deposits and sourcing the contributing sediment, it should be possible to determine rates of sediment accumulation and erosion, as well as date the minimal age of forest clearance, and perhaps cultivation, on the slope. Such a task has commenced near the cultivation limit in the upper Chimbu valley where oral histories indicate forest clearance as recently as around 1900 AD. However, the inhabitants have a poor oral tradition spanning at most three to four generations even though apparently older events are recalled.[5] Preliminary dating of one *talud* (Figure 1), by the C-14 method, indicates that development began about 1610 AD (340 years ±160 BP (ANU-8703). This is much earlier than that of any oral account. It also shows that initial forest clearance must be at least as old as *talud* development, and possibly much older, if the establishment of a barrier across slopes took place some time after clearance. This earlier-than-expected age of forest clearance is of additional interest since the site, c. 2700m altitude, is at the limit of sweet potato (*Ipomoea batatas*) cultivation – a New World root crop thought to have been introduced to the Philippines by Spanish explorers c. 16th century and then dispersed throughout the region (Micronesia and Melanesia). Prior to the widespread adoption of sweet potato,

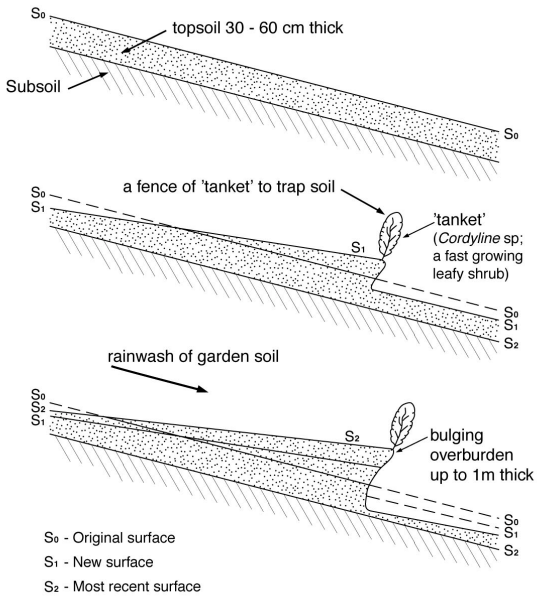
[4] Apart from these organic remains it should be noted that other types of materials suitable for dating and/or environmental reconstruction may be found. In some lynchets, for example, sherds and molluscs have proven useful (Fowler and Evans, 1967). In lowland sites in Melanesia, shells and pottery sherds may be expected but none were found in a recent excavation of a *talud* in Vanuatu.

[5] People recall the lands of ancestors and the reasons for migration, such as warfare and drought, but not any sense of when these events occurred, other than before the time of great-grandparents. See Humphreys and Brookfield (1991: 314).

extensive cultivation is thought to have been confined to altitudes below about 2200m, which is the effective upper limit of intensive taro (*Colocasia esculenta*) gardens.

As noted above it is also possible to comment upon rates of erosion and related matters. Thus, at the face of the *talud* (Figure 1b) about 90cm of organic rich soil has accumulated over the past 390 years. This is equivalent to an average longer-term rate of soil loss of about 70 mm/1000y (or 0.6 tonnes/ha/y) if it is assumed that the wedge of soil trapped by the *talud* is derived from the adjacent hill slopes. However, this value probably underestimates total soil loss for it also assumes that the *talud* fence has been effective in trapping the soil. For example, this rate is nearly five times less than the suspended load estimate obtained from a 6.3 km^2 catchment of tephra-mantled, undulating terrain at Kuk, 80km to the west (Hughes *et al*., 1991), and at least ten times less than soil loss measured on equivalent ash soils from microplots supporting fallow grasses, and from garden plots (Humphreys and Wayi, 1990). However, it is similar to the long-term rate of denudation for this environment (see footnote 2) and to net erosion rates estimated for the Yeni Swamp catchment by Gillieson *et al*. (1987). At this stage of the study it can be assumed that the *talud* fences probably trap a reasonable proportion of the soil transported downslope, but the actual sediment-trap efficiency remains unknown and will prove very difficult to establish.

Figure 2: Model of *talud* development



Talud deposits represent a potentially informative record that can be used to unravel land use histories on sites that, so far, have attracted little attention from archaeologists and palaeo-environmentalists, even though the use of similar features, such as lynchets, is well established in other parts of the world (e.g. Smith, 1975). Their prime advantage is that they provide a means of establishing independent histories of land use at the scale of individual hill slopes and slope segments. For this reason they are of importance in helping to evaluate the potential sustainability of land management practices. Still, the hill slope location of *talud*s limits the potential temporal and spatial extent of this type of deposit. In this sense the land-use histories obtained from them can only form part of a more complete and larger record obtained from other depositional sites such as swamps and lakes.

Acknowledgements

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THE AMAZON FLOODPLAIN: THE NEXT MAJOR FRONTIER FOR FOOD PRODUCTION

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Introduction

The development of the Amazon – the largest tropical forest area on the planet – has attracted world attention in recent years due to the extent and rate of deforestation that has been occurring. Major environmental disturbances (increasing carbon emissions leading to global warming, and losses of biomass, biodiversity, soil, water and nutrients) have been claimed to be a result of agricultural and forestry developments over the past three decades. It is estimated that at least 40 million hectares have been cleared for these purposes, an area about eight times the territory of Costa Rica.

Presently, population in the Brazilian Amazon is about 17 million people, and is projected to be 25 million by the year 2010. Because of the increasing rural and urban population, demands for food and fibre, and the need for environmental conservation and preservation, land in the Amazon must in future be used on a sustainable basis.

Considerable effort has been devoted in the past three decades to identify and promote alternative land use systems for reducing deforestation for agricultural and forestry development in the Amazon. Some success has been observed in replacing fire-reliant shifting agriculture by more sustainable production systems, increasing intensity of land utilization.

The *Várzea*

Along with increasing sustainability of land use systems on already deforested rain forest areas, other ways have to be sought for

reducing loss of the rain forest. Among these are the utilization of the well-drained (*cerrado*) and poorly-drained savannas, as well as the Amazon *várzea* floodplains. The *várzea*, one of the planet's richest ecosystems, covers some 20 million hectares of land along the floodable margins of the Amazon, and its tributaries with muddy, sediment-rich waters.

Because of the comparative advantage in relation to upland ecosystems, mainly in terms of soil-productive potential, the floodplain may become the next economic frontier in northern South America, on the basis of food production. In fact, *várzea* agriculture was the first major farming and fishery development in the region, facilitated by river navigation before the start of the road-building era in the 1960s. During the past two decades however, agricultural development in the floodplains has lost some of its importance because of the decline in extraction activities, and the increasing use of the rainforest upland areas. In more recent years, national and international concern about issues related to deforestation for agriculture and forestry has led to resurgence of interest in the *várzea*.

Notwithstanding their varied use of resources, small-farmer *várzea* agricultural systems are in the same broad class of shifting agriculture as those of the upland rainforest areas. They also use slash-and-burn practices, field rotation and grow predominantly annual food crops. There are, however, differences and they include the fact that the floodplain vegetation is less heterogeneous and includes large tracts of herbaceous, mainly grassy, vegetation. Also floodplain soils are more fertile than upland soils, so that shifting cycles are shorter. Floodplains are subject to the annual flooding-receding cycle, with its consequent risks. Moreover, agricultural and subsistence fishing activities complement each other in the floodplain.

Socio-economic sustainability of agriculture on the floodplain remains less than in the upland areas, because of deficient basic infrastructure (education, health and transportation), and problems arising from commercialization. At present low levels of population density ecological pressure on land resources is still bearable. But this cannot be said for floodplain fishing, since predatory fishing has increased dramatically in the last two decades.

The Prospect

The possibility of achieving sustainability of agricultural and forestry development in the floodplain is certainly higher than on the upland, mainly because of more favourable soil conditions. However, weed invasion, pests, diseases and the risks of flooding are constraints. More appropriate management of fish resources is essential.

The development potential of the floodplain has hitherto been explored mainly on paper and in conferences, and in debates within the political and scientific communities. Meantime, considerable changes are taking place. Ecosystems are being homogenized by cattle ranching, with significant deforestation and firing. Such uses may undermine long-term environmental productivity of both land and water.

The resource base of the floodplain is now being endangered, and this will have serious consequences for the future Amazonian population. Fisheries, in particular, are threatened by both habitat destruction and over-exploitation of stocks. It is urgent to develop a synthesis of what is known about these fisheries and the possibilities of aquaculture. There are at present no comprehensive models that anyone might use to protect and manage these resources.

Agriculture and fishery development in the Amazon floodplains are closely related, and cannot be treated separately. Any plan to promote development in the *várzea* must take account of the interplay of these related activities and their internal dynamics. A thorough understanding of how people now use the floodplain resources is essential as basis to any intervention, whether to protect forests, raise native animals for food, or grow crops.

SHORT ABSTRACTS OF SELECTED PAPERS DELIVERED AT THE BELEM MEETING OF THE AMAZON CLUSTER

There follows material drawn from abstracts of three papers delivered by present and intended cluster members in Belém at the meeting on August 10-12 1993. Abstracts, provided by the cluster leader, are edited and supplemented with related material. Mário Hiraoka also gave a paper, similar in coverage to that printed in PLEC News and Views No.1. (Editor)

David G. McGrath

Lake Reserve and Communal-Based Management of *Várzea* Resources

The *várzea* is one of the most productive environments of the entire Amazon basin. Thanks to its fertile soils, dense concentrations of fish and other vertebrates, and its natural accessibility, the *várzea* has played a central role in the regional economy since pre-Columbian times. *Várzea* settlement has typically been based on a strategy of multiple resource use, involving fishing, farming and animal husbandry. Over the years, *varzeiros* have adapted their subsistence strategies in response to changing opportunities in the regional economy. One after another, a series of different plant and animal resources have been the focus of the *várzea* economy, providing *varzeiros* with a difficult though fairly stable livelihood.

Today, this is under increasing pressure. The three main factors responsible are the collapse of commercial agriculture, the expansion of cattle ranching, and the intensification of commercial fisheries. The combination of these factors has led *varzeiros* to become increasingly dependent on fishing for their cash income and subsistence needs. The resulting pressure has substantially reduced the productivity of *varzeiro* fishing effort. At the same time, burning and overgrazing associated with the expansion of cattle ranching may be reducing the productive capacity of *várzea* fisheries. As a result of these trends, the viability of *varzeiro* subsistence systems and the ecological integrity of *várzea* systems are seriously threatened.

In response to depletion of the fisheries, communities throughout the lower Amazon are closing lakes to outside fishermen, and in some cases implementing measures designed to increase the productivity of lake fisheries. These lake reserves are promising models for the sustainable management of *várzea* fisheries, but little is known about the viability of lake management. The paper presented preliminary results of a study comparing fishing activity in two lake systems, one managed and one unmanaged. Preliminary results indicate that lake management can increase productivity both in general and of at least some commercially important fish species. The higher productivity of lake fisheries enables *varzeiro* households to devote more time to farming and animal husbandry, thereby increasing the overall productivity of the household economy. In conclusion, depending on the measures adopted, lake reserves appear to be a promising strategy for sustainable development of the *várzea* resource base.

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Deborah Lima Ayres

Implantation of a Conservation Unit in an Area of *Várzea*: the Mamiraua Experience

A conservation unit has been set up in Amazonas state, at the Mamiraua Ecological Station (EEM). About 4,500 people within the reserve occupy some 50 small communities, with an average of 14 houses in each. The main activities are agriculture, logging and fishing, guaranteeing good health and nutritional conditions, as our project has established. Cash activity provides only low incomes, about $US500 annually, of which 75 per cent is spent on basic supplies.

Legally, flooded areas belong to the Navy, but there are some private property titles of controversial validity. In any case, most of the *várzea* neighbouring the EEM focal area is considered *devoluta* and therefore open for exploration. While this raises issues of common-property resources, in the present case what is involved is competition between *varzeiros* on one side, and loggers, fishing companies and some large landowners on the other. The inequality of this conflict over a public domain has generated many conflicts along the Solimões, the Amazon and their tributaries. Subsistence is directly threatened. *Varzeiros* complain of the difficulties of catching fish and turtles for food, which were abundant in the quite recent past. Depleted stocks are the problem but, while there is little actual risk of extinction there are serious dangers of biodiversity erosion. The question that generates conflict, and mobilizes local communities, is the direct threat to their survival.

Dependency on exploitation of natural resources forces communities to support 'ecological' movements. The commercial fishing companies operate in itinerant manner, moving according to availability of fish. It is this migratory predation, rather than capitalist exploitation for its own sake, that is opposed. The method has been to close fishing areas for the exclusive use of guardian communities. Affirmation of common responsibilities and rights in this way is, however, without any legal basis.

There is no supporting legislation, although a way may be found through restriction of fishing equipment or in fiscal control through the Brazilian Institute of Environment and Natural Resources. Up to now, solutions put into practice are inadequate, and this is widely true of today's problems in the *várzea* and elsewhere in Amazonia (May, 1992).

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Christine Padoch

Management of Floodplain Resources in the Peruvian Amazon: a Review of Recent Research

Approximately 73 per cent of the total rural population of the lowland Peruvian Amazon live in *várzea* areas, although floodplains cover only three per cent of the total area. Much research has in recent years been done in the *várzea* and adjacent upland of the Peruvian Amazon, and has concentrated on the diversity and complexity of management patterns, and the economic value of floodplain resources. The presentation summarized a few significant findings.

Studies of agriculture and agroforestry have found very fine adaptations to small topographical differences, and consequent variation in soils, vegetation, and flooding regimes. The complexity of zonation is found to be compounded by historical, cultural and economic complexity to produce a situation of great management diversity. The dynamism of the patterns was also emphasized.

Another focus of recent interest is the dynamism of the floodplain ecosystems themselves, and the considerable economic value of their resources for both construction and food. Research has concentrated on the management of these resources, particularly those in low-diversity or oligarchic forests.

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ABOUT THIS NEWSLETTER

PLEC NEWS AND VIEWS is the main means of general communication within PLEC, and at the same time a principal means of telling others about PLEC. It will appear about twice a year (but not at exact intervals) through the life of the project. The first issue, published in July 1993, presented basic information about the project that will not appear again. In the present issue only an abbreviated statement appears on page 1. The second section of the Newsltter, PLEC NEWS, is a standard feature, and so also is the third, REPORTS FROM THE CLUSTERS. Lastly, there appear SHORT PAPERS, NOTES AND VIEWS, contributed by project members. The pattern may be varied a little through time and, if resources allow, additional material such as literature reviews on specific aspects of project interest may be added.

Editor

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