METHODS OF FARMER PARTICIPATORY RESEARCH FOR TECHNOLOGY DEVELOPMENT AND NATURAL RESOURCE MANAGEMENT

Annual Report 1998

CIAT PROJECT SN-3

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SUMMARY OF PROJECT SN-3:

METHODS OF FARMER PARTICIPATORY RESEARCH FOR TECHNOLOGY DEVELOPMENT AND NATURAL RESOURCE MANAGEMENT

Objective: To develop, apply, disseminate and institutionalize participatory methods, analytical tools, and principles of organizational design that result in demand-driven responses among R&D stakeholders and contribute to improved agroecosystem productivity and health

Outputs: Widely applicable methods to involve users in the development of technology for crop production and natural resource management and to develop institutional models for conducting client-oriented research at the farm and landscape levels.

Gains: Users will be involved at early stages in decisions about technology design. Methods will be available for eliciting and incorporating users' preferences. Participatory research will be applied on a routine basis in CIAT programs. At least three major universities in Latin America will have the capacity to teach participatory research methods. At least 1,000 trainees and 40 trainers will be able to teach these methods in the region. Training materials and methodology will be published and widely disseminated. The contribution of participatory research to rates of technology adoption will be measured in targeted areas. Lessons learned and methodologies will be disseminated worldwide in conjunction with the systemwide program on participatory research and gender analysis (SP-PRGA) convened by CIAT and through a project on Farmer Participatory Research for IPM (FPR-IPM) of the systemwide IPM program (SP-IPM).

Milestones:

1998 The most significant 1998 Milestones are: Courses offered on methods in three countries with replication of the CIAL institutional model now occurring in eight countries; Methods introduced to NARs for participatory plant breeding and research management in at least six countries; Release of a user-friendly statistical application for analysis of farmer preference data; Nationalization of the CIAL methodology by CORPOICA in Colombia; Interinstitutional plan for application of the CIAL methodology in Honduras and for linking the CIALs to participatory breeding of maize and beans. Tools for monitoring and evaluation of CIALs; Website and listserver for the FPR-IPM project of the SP-IPM; Workshops in three countries to introduce GIS and other decision support tools to stakeholders. Analysis of issues related to sustainable development and recommendations for orienting agricultural R&D in the forest margins benchmark site. (For a comprehensive list, see Logical Framework)

1999 At least 40 trainers prepared. Methods developed for decentralized; participatory research on ICM[1] and crop-crop livestock systems. User-differentiated adoption impact assessed in economic terms. Methods disseminated worldwide

2000 Institutionalization of methods in NARS and CGIAR as widely accepted tools of development-oriented agricultural research, in conjunction with SP-PRGA

[1] Integrated Crop management (ICM) is defined to encompass pest, disease, water and fertility management by farmers

Users: This work will benefit poor farmers, processors, traders, and consumers in rural areas, especially in fragile environments. Researchers will receive more accurate and timely feedback from users about the acceptability of production technologies and conservation practices. Researchers and planners will profit from methods for conducting adaptive research and implementing policies on natural resource conservation at the micro level

Collaborators: NARS, NGOs, universities, CGIAR SP-PRGA members, SP-IPM members

CGIAR system linkages: Organization and Management (70%); Training (30%) Convenor of SP-PRGA, Coordinator of FPR-IPM project of SP-IPM

CIAT project Linkages: Inputs to PE-1, PE-3; PE-4, PE-5, IP-1, IP-2, IP-3, IP-5, SN-1, BP-1; Outputs from: PE-3, PE-4, IP-3, BP-1, SN-1

WORK BREAKDOWN STRUCTURE FOR PROJECT SN-3:

METHODS OF FARMER PARTICIPATORY RESEARCH FOR TECHNOLOGY DEVELOPMENT AND NATURAL RESOURCE MANAGEMENT

Project Objective

To develop, apply, disseminate and institutionalize participatory methods, analytical tools, and principles of organizational design that result in demand-driven responses among R&D stakeholders and contribute to improved agroecosystem productivity and health

OUTPUTS	Methods for farmer participation in ICM, germplasm improvement and NRM	Models and procedures for organizing participatory research	Trained professionals and paraprofessionals able to conduct participatory research; FPR methods disseminated
ACTIVITIES	• Consolidate and scale-up CIALs • Develop methods for participatory monitoring and evaluation, and impact assessment of CIALS • Develop participatory methods and tools for decentralized plant breeding • Develop participatory methods for ICM[2] and crop-livestock systems at the landscape scale • Develop tools for market assessment by rural agroenterprises • Develop tools for stakeholder analysis • Develop analytical tools for defining research agendas in complex settings	• Develop models and procedures for organizing CIALs at the second-order level that incorporate mechanisms for self-sustaining financing and management • Develop models and procedures for organizing decentralized agricultural research at the farm level • Develop models and procedures for organizing decentralized participatory research at the landscape scale on ICM, soil conservation and fertility management and crop-livestock systems	• Institutionalize capacity to train in the CIAL methodology in NARS, NGOs and universities • Train R&D professionals in participatory research methods • Train professionals in establishing farmer participation in multiinstitutional consortia • Publish research results, training and public awareness materials

[2] Integrated Crop management (ICM) is defined to encompass pest, disease, water and fertility management by farmers

LOGICAL FRAMEWORK FOR SN-3[3]:

GOAL: To develop, apply, disseminate & institutionalize participatory methods, analytical tools, & principles of organizational design that result in demand-driven responses among R&D stakeholders & contribute to improved agroecosystem productivity & health PURPOSE: • To link local agricultural & NRM experimentation with formal research for development of environmentally sound agricultural & NRM technology • To develop methodology & consolidate organizational models for participatory research in agriculture & NRM • To develop analytical tools for defining research agendas in complex settings • To improve capacity to conduct participatory research	• R&D organizations applying participatory methods, analytical tools, & organizational models • Universities teaching participatory methods • Increased feedback among R & D stakeholders • Greater diversity of agricultural products, higher-value crops, &/or more value added locally to agricultural production in benchmark sites • Increasing number & diversity of agricultural & NRM technologies tested/adapted by farmers & other clients.	• Impact evaluation studies • Reports & publications	• Teamwork; good coordination & integration among collaborators • Minimal conflicts in scheduling of activities • True client participation occurring • Field-based staff playing a truly facilitative role • Reliable benchmark data against which progress can be measured

[3] With the arrival of the new SN-3 project manager in 1998 some modifications have been introduced to the Logical Framework and the Work Breakdown Structure of the mid-term plan. These are shown in this report.

Outputs	1998 Milestones	Means of verification	Important Assumptions
1. Methods for farmer participation in agricultural research and NRM ("How to do Participatory Research")			
1.1. FPR methods at the farm scale			
1.1.1. Consolidation and scaling-up of CIAL methodology	• Nationalization of CIAL methodology by CORPOICA • Initiation of CIALs by FONIAP • Formation of interinstitutional network to support upscaling of CIALs in Honduras • 235 CIALs operating in 8 countries	• National Technology Transfer plan and project in Colombia • Project proposals • Memorandum of Understanding with CORPOICA • Trip reports, minutes of meetings	• Continuity of national funding • Continued commitment of partner institutions
1.1.2. Methods for participatory monitoring and evaluation, and impact assessment of CIALS	• Tools for assessing self-management and comprehension of the research process • Completion of fieldwork for impact study of Cauca CIALs	• 1998 Annual report, Final report to WKK Foundation	• Collaboration with BP-1
1.1.3. Participatory methods for decentralized plant breeding	• Adoption of PPB methodology by CNPMF • Release of two cassava varieties in NE Brazil selected with farmer participation • Extension of PPB model to cassava production systems and IPM by CORPOICA • Interinstitutional proposal for PPB of maize and beans in Honduras • Interinstitutional plan for PPB of beans in Nicaragua • Release of user friendly statistical application for analysis of farmer preference data	• Trip reports, minutes of meetings, project proposals, • Spanish version of manual for preference ranking software, Beta version of English version	• Obtention of funding for PPB work in Honduras and Colombia

Outputs	1998 Milestones	Means of verification	Important Assumptions
1.2. FPR methods and tools at the landscape scale			• Adequate staffing and development of TOT for the CIAL methodology to free SN-3 staff time currently devoted to training
1.2.1. Methods for participatory research with soil conservation, fertility management and crop-livestock systems NEW	• Proposal for forage germplasm targeting for multiple uses in smallholder production systems in the hillsides of Central America • Landscape-level method for control of soil erosion with sugarcane, rice and live barriers	• Proposal document • Annual report	• obtention of funding • Collaboration with IP-5 ,PE-2, PE-3, PE-5, SB-1
1.2.2. Participatory research methods for integrated crop management NEW	• Establishment of FPR-IPM website and listserver • Concept note for FPR-IPM study tour • Landscape-level method for management of leafcutting ants • Landscape-level method for management of the maize pest *Macrodactylis ovaticollis*	• HTTP://www.ciat.cgiar.org/fpr-ipm • fpr-ipm@cgiar.org • Annual report	• Researcher perceptions of security situation in Colombia permit continuity in field work
1.2.3. Tools for market assessments by rural micro enterprises NEW			
1.2.4. Tools for stakeholder analysis NEW	• Methodology to identify stakeholder groups	• Annual report	• Researcher perceptions of security situation in Colombia permit continuity in field work
1.2.5. Analytical tools for defining research agendas in complex settings NEW	• Recommendations for orienting agricultural R&D in the forest margins benchmark site	• Issues paper	

Outputs	1998 Milestones	Means of verification	Important Assumptions
2. Models and procedures for organizing participatory research ("How to organize to do participatory research")			• Adequate staffing and development of TOT for the CIAL methodology to free SN-3 staff time currently devoted to training
2.1. Models and procedures for organizing CIALs at the second-order level	• Formation of 2nd order CIAL organization in Nicaragua • 2nd National Encuentro CIAL held in Honduras • Regional Encuentro CIAL held in Honduras • 8th Encuentro CIAL held in Colombia	• Video and proceedings of Encuentros CIAL	
2.1.1. Mechanisms for self-sustaining financing and management of CIALS NEW	• Establishment of endowment for CIALs in Honduras • Analysis of successes and failures in microcredit services (SN-1)	• IPCA report • SN-1 Annual report	• Collaboration with University of Guelph
2.2. Models and procedures for organizing PR at the landscape scale NEW			• Adequate staffing and development of TOT for the CIAL methodology to free SN-3 staff time currently devoted to training
2.2.1. Organizational models for decentralized research on ICM, soil conservation and fertility management and crop-livestock systems NEW	• Methodology to stimulate collective management of natural resources at the microwatershed level	• Annual report	• Researcher perceptions of security situation in Colombia permit continuity in field work • Collaboration with PE-2. PE-3, PE-5
2.2.2. Models and procedures for organizing multi-institutional consortia with farmer participation	• Integration of CIALs in Calico River watershed management consortium, Nicaragua • CIPASLA case study • Establishment of CIPASLA-Buga • DEPAM small-grants projects selected and initiated	• Annual report • Manual on establishment of interinstitutional consortia for NRM based on CIPASLA experience • PE-5 report	• Staffing continuity in Nicaragua • Collaboration with PE-3 and PE-5

Outputs	1998 Milestones	Means of verification	Important Assumptions
3. Trained professionals and paraprofessionals able to conduct participatory research; methods disseminated			
3.1. Capacity to train in the CIAL methodology institutionalized in NARS, NGOs and universities	• CIAL courses held in Venezuela, Colombia, Nicaragua	• Course reports/evaluations	
3.2. NARS plant breeders trained in PR methods for decentralized breeding	• PPB methods course held in Honduras • PPB methods course held in Ethiopia	• Course reports/evaluations	
3.3. Professionals trained in organizing farmer participation in multi-institutional consortia	• Well-being indicators, stakeholder analysis, poverty mapping and CIAL methodology disseminated in workshops on decision support tools	• Workshop reports/evaluations	• Collaboration with PE-3
3.4. Professionals trained in participatory research methods	• Course held in Pucallpa for DEPAM project stakeholders • In-service and formal training for IP-3, PE-5, and SN-1 staff • Cross-training of SN-3 staff in CIAL methodology and PPB statistical application	• Course reports/evaluations	
3.5. Publications and training materials	• Book-length report on CIAL methodology • Issues paper on R&D for forest margins benchmark site • Spanish language manuals for CIAL trainers • CIPASLA manual • Spanish language manual on statistical application for analysis of user preference data • On-line library of FPR-IPM website • Low-literacy version of CIAL handbooks	• Published documents	• Upgrading of bilingual language capacity in SN-3 • Adequate staffing of SN-3

HIGHLIGHTS OF RESEARCH PROGRESS:

- 235 CIALs[4] established in eight countries providing a research service to their communities, providing linkages to the formal research establishment and improving the efficiency of public-sector R&D
- Nationalization of the CIAL methodology in Colombia by CORPOICA with commitment to demand-driven research
- Higher adoption of improved crop varieties in CIAL communities
- Greater diversity of experimentation in CIAL communities
- More experimentation with soil conservation and fertility management practices in CIAL communities
- Significant penetration of CIAL results and technologies into neighboring communities
- Tools for monitoring and evaluation of CIALs developed
- Main conclusions from a systems analysis of R&D issues related to the forest margin benchmark site include the following:
  1. The agricultural development of the region depend historically on exogenous factors including heavy subsidies from nature, transient economic booms, and government subsidies.
  2. Centralism and institutional instability in Peru and net economic outflows from the region determine important structural constraints to economic growth and development.
  3. Small farmers are poor in capital and labor. They face a complex set of difficulties that include lack of access to credit, technical support, and markets. Therefore, agricultural technology alone is highly unlikely to make significant impacts on wellbeing.
  4. There are important gaps and entrenched prejudices in our understanding of colonist smallholder farmers in the region, particularly in terms of their socioeconomics, culture, knowledge, and decision making. A crucial aspect of this problem relates to the opportunistic, diversified economic activity of the farmers, and how they utilize on and off-farm resources. Effective R&D must build upon the productive mosaic managed by farmers.
  5. Available productive on-farm technology developed by national and international institutions is often unsuited to smallholder needs. An important effort in adaptation and integration of technologies is needed.
  6. Participatory approaches to R&D are extremely new in the region, current activities are poorly coupled with existing local expertise, and show strategic limitations (e.g., gender bias that underestimates the role of women in farmer family production and wellbeing).
  7. Integrated approaches (even technological) to R&D are generally lacking.
- User feedback obtained on decision support tools for natural resource conservation at watershed level
- Methodology developed for participatory systems trial at the landscape level with stakeholder groups related to:
  1. control of leafcutter ants
  2. control of the maize pest *Macrodactylus ovaticollis*
  3. control of soil erosion with live barriers
  4. reforestation of springs
- Methodology to identify stakeholder groups and to stimulate collective management of natural resources in micro watersheds developed

[4] CIALs are farmer agricultural research committees

PROGRESS REPORT ON ACHIEVEMENTS:

SN-3 has just completed a book length report to the W.K. Kellogg foundation on the CIAL methodology. This report covers achievements related to the following *outputs:*

1.1 FPR Methods at the farm scale
- 1.1.1. Consolidation and scaling up of CIAL methodology
- 1.1.2. Methods for participatory monitoring, evaluation and impact assessment of CIALs

2.1 Models and procedures for Organizing CIALs at the second-order level

3.1 Capacity to train in the CIAL methodology Institutionalized in NARS, NGOs and universities

The complete report is available as a companion to this annual report document

In addition to presenting progress related to the CIAL methodology this report will focus on several other outputs related to FPR methods at the farm scale (Output 1.1) and *FPR methods at the landscape scale* (Output 1.2).

Participatory methods for decentralized plant breeding (Output 1.1.3)

Analytical tools for defining research agendas in complex settings (Output 1.2.4)

A comprehensive report on work integrating Output 2.2.1 (Organizational models for decentralized research on ICM, Soil conservation and fertility management, and crop-livestock systems) and *Output 1.2.4 (Tools for stakeholder* Analysis) is presented.

Outputs(1.1.1.); (1.1.2.); (2.1.); & (3.1.)
The CIAL Methodology

Main achievements:

- 235 CIALs[5] established in eight countries providing a research service to their communities, providing linkages to the formal research establishment and improving the efficiency of public-sector R&D
- Nationalization of the CIAL methodology in Colombia by CORPOICA with commitment to demand-driven research
- Higher adoption of improved crop varieties in CIAL communities
- Greater diversity of experimentation in CIAL communities
- More experimentation with soil conservation and fertility management practices in CIAL communities
- Significant penetration of CIAL results and technologies into neighboring communities
- Tools for monitoring and evaluation of CIALs
- Interinstitutional plan for linking the CIALs to participatory plant breeding (PPB) of maize and beans in Honduras.
- Release of a user-friendly statistical application for analysis of farmer preference data
- Adoption of PPB methodology by CNPMF, Brazil
- Extension of PPB model to cassava production systems and IPM by CORPOICA

Interinstitutional plan for PPB of beans in Nicaragua

The final report to the Kellogg foundation, entitled *Investing in People: The farmer-researcher as the protagonist in rural development,* is available as a companion to this annual report document in lieu of a progress report.

[5] CIALs are farmer agricultural research committees

Output 1.1.3.
Participatory methods for decentralized plant breeding

Luis Alfredo Hernandez

Main achievements:

- Interinstitutional plan for linking the CIALs to participatory plant breeding (PPB) of maize and beans in Honduras.
- Release of a user-friendly statistical application for analysis of farmer preference data
- Adoption of PPB methodology by CNPMF, Brazil and release of two varieties selected with farmer participation
- Extension of PPB model to cassava production systems and IPM by CORPOICA
- Interinstitutional plan for PPB of beans in Nicaragua

This report will focus on *adoption of* PPB methodology by CNPMF

The objectives of the project "Development of Casava Germplasm for the semiarid conditions of Northeast Brazil," include increasing the genetic diversity and contributing to the stability of the production system in this fragile zone. The project contemplates the implementation of a participatory methodology that involves farmers in the process of germplasm selection that they carry out on their farms. Participatory Breeding of Cassava (PBC) was tested and adapted to Brazilian conditions through a strategy of training in diagnosis, planning, evaluation and feedback.

The methodology has been applied in the northeastern states of Bahía, Pernambuco and Ceará and has involved collaboration between CIAT and CNPMF. The effort has a four year history in Brazil and has brought CNPMF national recognition amongst EMBRAPA centers as the leader in participatory research.

Among the results is the multiplication of planting material of varieties selected by farmers. This can be considered as the initiation of a process of adoption of technology generated with the participation of the users themselves.

Table 1. Varieties recommended via PPB for semiarid conditions in Northeast Brazil

Site			
Quixada	Araripina	Petrolina	Itaberaba
BGM 0260	BGM 0002	BGM 0537	BGM 0869
BGM 0195	BGM 1303		BGM 0538
BGM 0549	BGM 1380		BGM 0576
	BGM 0153		BGM 0812

Clones in boldface type were formally released by CNPMF.

A total of 94 participatory trials were established from 1994-1997. The process developed most rapidly in the Quixada site, resulting in the release of two varieties "Rosa" (BGM –260) for fresh consumption and animal feed and "Amansa Burro" (BMG 0549) as raw material for farinha production. The variety BGM 0195 is now in the pre-release phase.

The main advantage of BMG 0260 is excellent culinary quality compared to the local variety "Buja". BGM is superior to "Buja" as a raw material for farinha production. Both possess better germination and establishment rates, important characteristics for semiarid conditions, and retain their leaves during extreme droughts, thus providing a source of animal fodder. The participatory evaluations have resulted in multiplication and distribution of these materials by farmers, overcoming a traditional bottleneck in the diffusion of improved cassava varieties. Farmers' selection criteria are summarized in Table 2.

Table 2. Farmers' principal and complementary selection criteria

Farmer Selection Criteria	
Principal	Complementary
• Germination rate • Starch content and farinha quality • Number of thick roots • Capacity to produce cuttings (multiplication rate)	• Ease of harvest • Ease of peeling • Absence of root cracks • Absence of root peduncle • Root skin color • Root flesh color • HCN content in the roots • Plant type (low to medium height) • Number of branches • Retention and yield of foliage

Contributors:

- Wania Fukuda, CNPMF

Output 1.2.5.
Analytical tools for defining research agendas in complex settings

A DISCUSION OF ISSUES IN THE PUCALLPA BENCHMARK SITE, FROM AN AGROECOSYSTEM PERSPECTIVE, WITH RECOMMENDATIONS FOR R&D

--DRAFT. NOT FOR CITATION--

Ernesto F. Ráez-Luna, Tamsyn Murray, David Waltner-Toews

INTRODUCTION

Agricultural R&D in tropical agroecosystems that achieves ecologically sound, sustainable impact is a complex multipurpose endeavor. It involves striking a balance, in specific settings, among a set of requirements that have not traditionally come together. These requirements are related to the CGIAR's two overall goals, *poverty alleviation* and *ecological sustainability*. The requirements are *integration*, *impact*, and *generalization*. They are listed here in approximate logical order, so that we would expect that adequate integration should lead to desired impact, and, in due time, allow generalization. Integration can be seen then as a special skill or technical expertise that we need to develop and apply in order to obtain sustainable impact on socioeconomic and ecological health, as well as to better assess where and how can we fruitfully apply our experience beyond the pilot stage and the initial case study site.

By integration, we refer to three different challenges: (1) integrated *understanding* of issues; (2) integrated *development* of solutions; and (3) integrated *intervention*. What must be integrated are the multiple actors—perspectives—purposes and aspects—sectors—scales of reality of which ecological-economic systems are made. In practice, the three aspects of integration are linked, so that understanding (diagnosis) is not an independent activity, but makes a permanent part of the development of solutions and the unfolding of interventions. In this sense, integrated *understanding* can be seen as a synonym of built-in project *monitoring* or *impact assessment*. The key consideration is that integration provides an *adaptive* framework for action.

Critically exploring the pressing issues of a specific agroecosystem or landscape with an open mind (as uncluttered by disciplinary bias as possible) provides the first glimpses of on what, with whom, where, when, and how our own efforts and abilities can be better used. This activity should not be taken for granted even in heavily studied settings. Scientific research and policy-making, by definition, are biased toward the points of view and the values of the researchers and policy makers involved in a given moment, and often fail to provide other perspectives or a sense of dynamics. This is particularly true of offer-driven technological research, based upon highly specialized knowledge and often limited to short-term intensive interventions.

A critical exploration of issues also provides a clearer picture of factors or driving forces that escape our own capacity of action, but still are of paramount importance in the behavior of the system. These driving forces, which *frame* or *limit* our impact, must be

confronted in practice throughout strategic alliances and consequently a wider set of actions (and a greater commitment) than traditionally allowed.

Issues and stakeholders are inextricably linked. Therefore, stakeholder participation is inextricably linked to the solution of issues. At the same time, we must be aware that not all stakeholders have the same access to scientists and policy makers. More often than not, it is the poor who we are supposed to serve (and the poorest among the poor, such as indigenous peoples, women and children), those whose saying has the lesser acceptance. A sound exploration of issues must then make visible not only the ignored facts, but also, and overall, the forgotten actors. Indeed, to a great degree, the value of integrated understanding can be seen as shedding light on the overseen, the underestimated, and the forgotten; thus challenging our tendency to rest our judgments on what has been previously labeled as known, important, and relevant.

Integrated research must be used as a decision support tool. It must be used to prioritize actions and combine different specialized interventions, as well as to update our decision maps. Finally, in its more powerful application, integrated research must provide input for progress, by challenging our worldviews and intentions.

This document explores and intends to provide an integrated view of the pressing issues in the Ucayali region of Amazonian Peru. The most heavily populated, farmed, and ecologically disturbed area of Ucayali, nearby the city of Pucallpa and along the road to the country's capital, is a benchmark site for the CGIAR, in the "forest margins" ecoregion. Here we provide an analysis of basic issues affecting the benchmark site, as suggested by Peruvian and international experts, and identify interactions between them, as well as major gaps. Then, we re-integrate a group of selected issues into one set, in order to highlight interactions and facilitate discussion of decisions and actions. This set roughly corresponds to a discussion of the economic activity in the region, with an emphasis on agriculture and development. Two other sets of issues, related to (1) the identity or nature of the small colonist farmers, as related to land use and sustainable development in the region, and (2) land use and deforestation in the agricultural frontier, will be the matter of separate documents. These sets of issues have been chosen to inform the main concerns of the CGIAR institutes: agricultural economic development, ecological-economic degradation, and the rural poor.

The document includes a group of specific recommendations for the enhancement of the CG centers' activities and impact in the Pucallpa benchmark site. Beyond its expected value as food for decisions in a specific setting, this review also exemplifies the systems-oriented, integrated approach to research advocated by the CIAT-Guelph project.

THE STUDY SITE AND ITS CONTEXT

The Site

Pucallpa is the capital city of the Ucayali department or region[6], in the Peruvian Amazon lowlands (Figure 1). Ucayali has an area of 102,517.18 Km^2. This territory lies largely

[6] Departments (*departamentos*) are the second-level administrative divisions in Peru. Overlapped over them are the regions (*regions*). These may encompass one or more departments, and were intended as federal political divisions, with their own elected government and budget. In practice,

below 500 m.a.s.l., in the broad basin of the Ucayali river. A road connecting Pucallpa with Lima (Peru's capital city) exists since the 1950s and it has facilitated the spontaneous colonization of Ucayali.

Within Ucayali we recognize several **sub-regions** that bear significant differences in terms of ecological characteristics, demographic features and economic activity (Figure 2). Land use and economic processes in the different sub-regions articulate in a regional pattern of production. We differentiate:

1. The agricultural and heavily settled territory along the Pucallpa-Lima road and the Aguaytía river, including the city of Pucallpa (the **Pucallpa sub-region**). Human population in Ucayali concentrates in Pucallpa city (65%, INEI 1994) and along the road and its main branches. Overall, the Pucallpa sub-region contains 82% of Ucayali's total human population at an average density of 19 individuals/Km^2 (IIAP/CRP 1996). The rest of the department is sparsely inhabited, with population densities as low as 0.19 ind./Km^2 in remote Purús. Deforestation and agricultural activity in Ucayali concentrate also in the Pucallpa sub-region. The rest of Ucayali is still dominated by meandering rivers and rainforests.
2. The natural forests and main timberlands toward the Tamaya and Upper Ucayali rivers.
3. The extensive swamps and lakes of the Ucayali floodplain, rich in freshwater fish and *aguaje*[7] palm forests.
4. The relatively isolated uplands and hills covered by almost undisturbed primary forests to the SW and SE of the region, including the valley of the Purús river[8].

The Benchmark Site

The CGIAR has identified its benchmark site for the "forest margins" eco-region in the Pucallpa sub-region, in an area covering roughly 100 Km^2 (Figure 3). The best available information on the benchmark site and its conditions is provided by the recent surveys led by Sam Fujisaka (CIAT) within the context of the collaborative project on alternatives to slash-and-burn, and by Joyotee Smith (CIFOR). (See Fujisaka 1997, Smith *et al.* 1997).

Although it contains part of the Aguaytía river's floodplain, the benchmark site is a largely upland area, where very poor soils dominate. These uplands sharply contrast with the Ucayali's lowlands, seasonally flooded by the rivers and covered by rich entisols. East of the benchmark site, toward Pucallpa city, the terrain is swampy and dominated by *aguajales* (swamp palm forests). West of the benchmark site, as we climb up toward the Eastern slopes of the Andes, the terrain becomes increasingly hilly and the climate wetter. According to IIAP

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regions have not lived up to the promise of decentralized economic and political power that brought them into existence. Given its extent, the department of Ucayali alone is also a region.

[7] Mauritia flexuosa.

[8] This sub-region offers opportunities for the permanent conservation of the native biodiversity without disruption of more intensive land use elsewhere in the region.

(1996) croplands in Ucayali concentrate in this last area, in the Padre Abad province. Therefore, the benchmark site does not include most of the agroecological diversity in the Ucayali region or in the Pucallpa sub-region, although it may include the most challenging agricultural soils of the region.

Inter-regional Links

A constant flow of goods and people connect Ucayali at an **inter-regional** scale to the departments of the north-central jungle, particularly those in the Eastern Andean slopes (San Martín and Huánuco) and the Loreto department, in the Amazon lowlands. These departments are the main sources of immigrants to Ucayali, acting also as stepping-stones for immigrants from the Andes and the Pacific coast (Figure 4, INEI 1997).

San Martín, Huánuco, and Ucayali conform a fluid inter-regional network of commerce, production diversification, and access to land and labor. This inter-regional level is also related to the cultivation of coca for the illegal production of cocaine: During the 1990s, about 61% of the nation's coca-growing area concentrated in the Huallaga Valley of San Martín and Huánuco and in the nearby Aguaytía Valley of Ucayali (USAID/US Embassy Peru 1997).

National Context

Peru is a highly centralized country, with economic and political power concentrated in Lima City. It is the direct communication with Lima what has made Ucayali an important Amazon frontier. The most important product of the region, timber, is destined almost exclusively to the Lima market, and the main timber industrial and commercial enterprises are based in Lima. Decisions on agricultural and economic policy, such as credits, subsidies, and exchange rates are taken in Lima, and directly affect agricultural production in Ucayali.

Therefore, the economic behavior of the region responds to a great extent to the political economy of the nation. According to Gonzales and Samamé (1994), basic characteristics of Peru are (1) semi-industrialized economy oriented to primary exports, with very low levels of investment; (2) divorce between export-oriented industry and internally-oriented industry, with strong dependence of the internally-oriented industry on imported goods and technology; (3) weakness of political institutions able to resolve socioeconomic conflict and fragmentation, leading to increasing distributive inequity; and (4) lack of autonomy of the economic institutions from political power. The emergent behavior is a permanent swinging of economic policies between populism and orthodoxy, coupled to periods of subsidized economic expansion followed by subsequent recession, respectively. This behavior has been named "the Peruvian pendulum" (Gonzales and Samamé 1994).

About 60% of Peru's territory is covered by Amazonian rainforests. Nation-wide, top-quality arable land is extremely scarce (6.60%; ONERN 1982, Dourojeanni 1990). Rural poverty and annual population growth are relatively high (90.1% and 2.0%, respectively; INEI 1994, 1995a). Urban population, fed by a continuous exodus from the countryside, makes 66% of the total population, and concentrates in the cities of the arid coast (INEI 1996). Consequently, food security is a serious concern for Peru.

This situation, combined with a perception of Amazonia as an empty and rich land, has repeatedly fed ideologies of Amazon conquest, justifying since the 1940s the building of penetration roads and incentives for colonization and entrepreneurial activities in the Amazon. According to this vision, Amazonia must be occupied and developed into the food basket of Peru. The ideology of Amazon conquest was popular in Lima and among other governments of the Amazon region until the early 1980s, when the ecological and economic costs of failed colonization schemes became a world-wide public issue. The neo-liberal regime of Peruvian President Alberto Fujimori (1990 – present) does not offer incentives to colonization nor assigns to the Amazon lowlands the strategic importance that former administrations did. Instead, it views the Amazon as a potential source of native agroindustrial export products such as timber, *camu-camu* (Myrciaria dubia), an endemic fruit rich in vitamin C, and *uña de gato* (Uncaria tomentosa), an endemic medicinal plant. There is strong governmental propaganda to convince Peruvian Amazonian farmers to invest on this "promising" new crops.

IDENTIFYING THE ISSUES

We have followed a three-pronged approach to the identification of issues:

A first path involved independent brainstorm exercises with CIAT scientists working in the benchmark site (March 1997) and with Peruvian local experts (May 1997). We arranged the suggested issues thematically, identified common issues between CIAT scientists and local experts, and falsified the suggested issues against available evidence.

A second, related path involved a wide consultation of bibliographic material published in the last three decades, mostly of Peruvian sources. This provided us with a clearer picture of nation-level issues and how they affected the study site. Also, we were able to complement the original list of issues, as well as obtaining consolidating evidence. Finally, this literature review updated us on in-country research (mostly socioeconomic), strengthened our historical and cultural context and helped to build a better understanding of key information gaps.

Third, we repeatedly interviewed a wide arrange of people representing GOs, NGOs, and grass-roots organizations; international, national, and local. We want to stress the importance of this activity. Throughout open dialogue and confrontation of different viewpoints and data our understanding and language rapidly evolved to a level closer to that of local stakeholders, *and at the same* time we were enriched by the cross-fertilization allowed by our interaction with different peoples who normally do *not interact* among themselves. Indeed, we consider this active dialogue and cross-checking of views and data one crucial strength of the research method. A significant byproduct of this repeated dialogue was that it allowed us to keep track of recent developments in the study area and the nation.

To a large extent, our sources of information and dialogue partners were professional researchers and policy-makers. Grassroots representatives and direct practitioners are still under-represented in this review.

Different Mental Maps: Different Objectives?

One important initial finding is that the spatial reference for sustainable development in the study area is dramatically different between CIAT researchers and national researchers and policy-makers. While CIAT scientists refer to "Pucallpa" and a "benchmark site" area approximately 100 Km^2 in size, local experts repeatedly refer to the whole Ucayali region, a territory 100,000 Km^2 in extent (see Figure 3). Indeed, CODESU, the broad-base NGO that is the CG's main local partner in the Pucallpa benchmark site is named Consortium for the Sustainable Development of **Ucayali**.

The regional perspective is assumed by locals irrespective of the extent or location of their specific activities. Local experts readily acknowledge the significance of the Pucallpa sub-region in Ucayali, where the benchmark site is located. However, the emerging rationale for their regional perspective lies in the fact that the ecological-economic dynamics of the Pucallpa sub-region (and therefore the benchmark site) is inextricably linked to the land-use dynamics of the rest of the Ucayali region, particularly the timber-rich natural forests and the fish-rich and soil-rich floodplain. In other words, when discussing the development of the Pucallpa benchmark site, nationals assign strategic importance to the natural resources offered by the Ucayali region **outside** of the benchmark site and the Pucallpa sub-region, and to the historical exploitation of those resources.

This notion of a densely populated sub-region were ecological-economic problems concentrate, but which dynamics (and arguably its development) depends to an important degree of resources outside the sub-region, must be kept in mind as a keystone characteristic of the Pucallpa sub-region and the benchmark site. Taking this finding in consideration, together with the notion that the regional level of analysis is better fit for integrated, inter-sectoral research (Hegsdijk and Kruseman 1993), we decided to privilege a regional approach in this project, although keeping in mind the specific weight of the road-influenced sub-region, were the benchmark site is located.

ISSUE ANALYSIS

Brainstorming

Brainstorming is increasingly being used as the main source of ideas in a number of strategic planning applications. Planning-By-Objectives workshops normally start with a brainstorm of "problems", which are then organized in problem trees. A great deal can be said about the shortcomings of this approach to strategic planning, particularly on the dramatic effects of the composition of the planning group, including presence/absence of key participants (i.e., particularly knowledgeable and vocal people), the level of previous agreement or acquaintance among participants (i.e., degree of shared language, goals, and approaches), and the impact of hierarchical relations among the participants.

However, brainstorms provide a quick and rich list of working themes, allowing the planning exercise to flow. Thus, brainstorms cannot be dismissed completely. We decided to deal critically with the results of our brainstorm exercises. We were particularly interested in (1) comparing the performance of the national and international

researchers (which could shed light on the value of local participation), and in (2) evaluating the quality of the brainstorm exercise, regarding the level of truthful and relevant information embodied in the lists of suggested issues. This could shed light on the value of brainstorm exercises in general.

Caveats

When reading this section, several important caveats must be kept in mind. First, the list of issues was obtained in brainstorm exercises, where spontaneous ideas are encouraged and criticism is kept to a minimum. A more critical exercise would have yielded a more focused or site-specific set of issues, at the expense of breadth (and possibly also depth) of understanding, without necessarily improving the truthfulness of the final set[9]. Second, issues without evidence in favor are not always necessarily wrong, since in certain cases we simply lack corroborating evidence about them. Third, not all the possibly important issues were identified in the brainstorms. Indeed, this document responds to our need of obtaining a fuller picture of the case-study agroecosystem. Fourth (and related to third) that an issue has evidence in favor does not provide clues about the overall significance or relevance of the issue. Only contextualization, cross-checking and confrontation with other issues can provide us with that information. Fifth, the participants in the brainstorms were all experienced researchers, mostly related to the agricultural sector. Thus, the suggested issues came from a very specific set of stakeholders and must be considered as a biased set of issues. Still, they provided us with excellent orientation.

Comparing Brainstorming Results

Several important discoveries stem from a review of Table I. First, shared issues with evidence in favor make only 8% of the total. Non-shared issues in the exercise do not necessarily express conflict or disagreement between national and international experts. They only express difference. Still, difference was surprisingly large (87% of suggested issues were not shared). It is likely that this difference has already decreased significantly, as CIAT and Peruvian experts increased their interaction and collaboration.

[9] Since (hopefully) nobody will suggest an issue that he/she believes or knows untrue.

TABLE I. BRAINSTORMING ON PRESSING ISSUES IN THE PUCALLPA BENCHMARK SITE AND THE UCAYALI REGION

CATEGORIES	TOTAL		CIAT Scientists		Peruvian Experts		Shared	
	!	?	!	?	!	?	!	?
AGROECOSYSTEM	2	1	2	1	0	0	0	0
AGRICULTURE	5	7	4	6	1	2	0	1
FISHERIES	2	2	1	1	2	2	1	1
ECOLOGICAL	6	4	5	3	2	2	1	1
ECONOMIC	6	5	5	5	3	0	2	0
HUMAN HEALTH	3	3	3	2	0	1	0	0
DEMOGRAPHY	7	1	4	0	4	1	1	0
POLITICS / INSTITUTIONS	5	3	3	2	2	1	0	0
SCIENCE & TECHNOLOGY	2	0	0	0	2	0	0	0
TOTAL	38	26	27	20	16	9	5	3
% w/ evidence in favor	59%		57%		64%		63%	

! Evidence in favor

? Evidence against, insufficient, or contentious.

In general, national researchers showed slightly better aim than international researchers, which could be used as an argument in favor of local participation. Although the results suggest that the shared subset bears more evidence in favor than the total set, approaching the truthfulness of the nationals' subset, the small absolute value of shared issues does not allow any conclusions in this regard, although it again suggests possible synergic advantages in a participatory approach, where local social actors are consulted at the onset. National researchers tend to confront the local reality with greater frequency than international researchers, and have more opportunities to discuss and re-check their concepts against the evidence freely provided by their working environment. On the other hand, international researchers, at their best, may contribute a sense of the larger picture, as well as cross-fertilization from a wider choice of concepts and experiences.

Influence Diagrams

A simple way of assessing relationships, external validity, relative importance, and gaps among issues is arranging them across scales of reality and drawing influence connectors between issues. Figure 5 offers such influence diagram for Ucayali. Only major connections have been drawn to facilitate the reading of the diagram, and important chains have been emphasized with color. In interpreting the diagram, please keep in mind that issues at a given scale also happen at lower scales, usually with some specific features; while issues at lower scales may contribute or not to issues at higher scales. In other words, higher hierarchies influence lower hierarchies, but lower hierarchies do not always influence higher hierarchies. Plus (+) signs in the connectors identify reinforcing

interactions (the food of positive feedback loops); minus (-) signs identify dampening interactions (the food of negative feedback loops). There are very few minus signs in the diagram, suggesting a strongly self-reinforcing problematic, but this is partially due to the fact that almost exclusively problems (and not opportunities) are mapped. We find that:

1. In economic terms the **net outflow of capital** *from Ucayali (a region-level* phenomenon) establishes strategic constraints for the infrastructural and institutional development of the region as a whole. Thus, a classical trickle-down approach to development is unlikely to succeed in Ucayali if the unfavorable capital flows are not corrected somehow.
2. In political terms, the **concentration of power in Lima** (a nation-level phenomenon), mirrored by the concentration of power in Pucallpa city, stimulates directly or indirectly the economic outflow from Ucayali (as discussed above), the relatively low institutional development of the region, and urban immigration from the countryside. Centralism, a structural characteristic of Peru, determines a low development ceiling for most of the country, particularly for marginal regions like Ucayali.
3. In ideological terms, the **extractivistic / productivist bias** in the production of goods (a global issue), mirrored in Peru by the ideology of Amazon conquest, extractive *economic booms* (e.g., rubber), and government incentives to monocropping, has had a strong effect on deforestation and biodiversity loss (global issues), and wasteful exploitation of key regional resources such as timber and fish. On another path, this ideological bias has influenced research and technological development, favoring top-down, reductionist, and offer-driven approaches that (among other things) failed to appreciate the potential of native biodiversity and traditional multi-crop farming systems. Evidently, here is were agricultural R&D institutions have direct impact and can make an important difference.
4. The phenomenon of **migration to the city** from the countryside, although a global issue, has specific and dire consequences in Ucayali. Pucallpa city suffers a severe shortage of jobs and services, as well as serious health and pollution problems. On the other hand, it is a contentious issue if migration to the city is leading to a labor bottleneck for agricultural production in the Pucallpa sub-region and the benchmark site.
5. A complex of issues *including* ***lack of access to credit and technical support, and unreliable markets*** establishes a low ceiling for agricultural productivity and development, and acts as an expeller of rural population. It appears unlikely that any significant development will be achieved in farmer productivity or income without some level of credit.

Gaps

The influence diagram allows quick identification of information gaps among the participant stakeholders (areas where no issues have been suggested). We find that main gaps concentrate at the farm level, reflecting the identity of the stakeholders involved (researchers, not farmers), and providing evidence of the need to involve grassroots in this kind of process. From top to bottom in the scale hierarchy, gaps relate to:

1. The impact of globalization and global power interactions.

2. At the national level (or at the scale of the Western Amazon lowlands) there is an important gap in our understanding of land-use patterns and dynamics. However, projects such as Alternatives to Slash-and-Burn, CIAT's PE-4 (including this project), and CIFOR's [Secondary Forests] are contributing to fill the gap.
3. At the same level, there is a major gap in our understanding of technological demand and offer for natural resource use and agriculture in the Western Amazon. IIAP[10] in Peru and TCA[11] in the Amazon region are dedicated to improving knowledge on both areas (although biased toward technological offer rather than demand), which identifies them as strategic allies.
4. Finally, at the level of farmers in the Pucallpa sub-region and the benchmark site, there are still large gaps in our understanding of their socioeconomics, their decision-making, and the dynamics of their knowledge (i.e., who knows what, how is knowledge gained and how it is shared among farmers). In this regard, the surveys led in Pucallpa by the CG centers in 1996, 1997, and 1998 (Fujisaka 1997, Smith 1997) contain a wealth of information that is not being used in its full potential. Also, we may expect that as participatory interventions develop in the area, they will provide us with first-hand information on the farmers and their livelihood, although this must not be taken for granted[12].

Additional Issues

From literature reviews, repeated visits to Pucallpa, and a number of interviews in Peru, we have identified the next additional issues:

1. "Subsidy from nature" (Redford 1992) to unsustainable farming system through timber, fish, game, and **firewood**.
2. Strong gender bias against women in agricultural R&D (national and international), although national expertise available and utilized by a few projects and grassroots organizations.
3. Complete lack of integrated approaches to R&D in the region (with the possible exception of the MADEBOSQUES project).
4. Lack of understanding of regional and national market dynamics among researchers, officers, and farmers.
5. Insufficient and sometimes inadequate technological offer.
6. Significant degree of alienation of farmers from the Ministry of Agriculture. This is mostly due to top-down attitude among government officers and priorities decided in Lima without farmer input.
7. Multiactive and opportunistic economic performance among farmers: access to off-farm ecosystems / resources and to on-farm non-agricultural resources.

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[10] *Instituto de Investigaciones de la Amazonía Peruana* (Peruvian Amazon Research Institute).
[11] *Tratado de Cooperación Amazónica* (Amazon Cooperation Treaty).
[12] We must differentiate between tactical and strategic PRA. For instance, participatory research may be limited to the testing or development of specific agricultural technology, without ever bothering to significantly increase knowledge on the farming system and the farmer society, just as non-participatory research may be designed to provide exactly that kind of information. Participatory research and action need to be specifically designed in order to increase socioeconomic knowledge among the participants (researchers, extensionists, and farmers), thus empowering them to achieve system-level, sustainable development.

8. Lack of clear goals in cattle ranching activity: Underutilized pastures, high cost of cattle ranching to small farmers, stiff market constraints, important regional beef-and-milk substitutes, and contentious nature of extensive cattle ranching in the Amazon.
9. Lack of access to markets by producers. Dominance of the middlemen by means of indebtment, due in large part to lack of working capital among small farmers.
10. Lack of knowledge and expertise on participatory approaches among most local researchers and government officers, although national expertise available and utilized by a few projects and grassroots organizations.
11. Inter-sectoral divorce, particularly along the agriculture-health-fisheries axis, related to land use and food production.
12. Significant (increasing?) chronic malnutrition among the rural population (particularly children), linked to food insecurity (particularly supply of high-quality protein) and perhaps unsound feeding habits.

STRUCTURING THE ISSUES

In this section we discuss selected issues together, grouped in one thematic line: economics and agriculture. Two more thematic lines, colonist farmer livelihood, and land use and deforestation, will be treated in separate documents. The idea of the following account is to stress links between issues and sort them out by their relative importance, as they relate to the sustainable development of the region and the benchmark site.

Economics and Agriculture

The Invisible Forest

According to INEI (1993) during the period 1979-1992 agriculture and agroindustries made up 50% of Ucayali's GDP, "standing out the exploitation of timber". According to Blanco *et al.* (1986), in 1983 the Gross Value of Production (GVP) in Ucayali's timber activity contributed 53% of the agricultural GVP, and 20% of the department's total GVP. According to Ara (1997), in 1996 the timber activity in Ucayali contributed 22% of the regional GDP, 4% of it from its primary subsector (extraction) and 18% from its secondary subsector (transformation).

In order to understand the importance of these figures, we must compare them against the total contribution of the primary and secondary sectors to the regional GDP. In 1996, the total primary sector contributed 33.2% to the regional GDP, 96% of it corresponding to agriculture (INEI 1997). Therefore, if we follow Ara's figures, the timber activity alone would correspond to 12.0% of the primary GDP, and to 12.6% of the agricultural GDP. Unfortunately, we do not know how trustable are these calculations on the primary sector, since it is not clear to what degree the extraction of timber (a partially clandestine activity) is accounted for in the official estimation of the regional GDP[13]. Therefore, the importance of the timber activity is largely under-estimated. In the secondary (transformation) sector, however, timber is well recorded. Thus, if we take into account that the total transformation sector contributed 25% of the regional GDP in 1996 (INEI

[13] Economic statistics in Peru aggregate "silviculture", wildlife hunting and agricultural production (crops and livestock) in one class. When these figures are compared against crop and livestock statistics alone, it often appears that "silviculture and wildlife" are named but not recorded. The repeated and ill-recorded changes in political interests, currency, and administrative boundaries obscures even more a correct interpretation of primary sector statistics at the regional level.

1997), then as much as 72% of the secondary GDP was contributed by the timber industry.

All the evidence leads to conclude that in spite of the tendency to view Ucayali as an agricultural frontier dominated by monocrops and cattle, the main "agricultural" activity in the region's history is **timber exploitation** from natural forests. This activity has a dominant impact in the region's economy. The following overview of the activity sheds light on the productive structure of the region and on the structural constraints to its development.

Most of Ucayali's timber production is consumed within the country, particularly in Lima. Ucayali alone supplies 35.6% of the sawn wood produced in Peru, 59.3% of the plywood, and 32.3% of the flooring tiles (INRENA 1994). Pucallpa is known as the "timber capital" of Peru. Only a small fraction of Ucayali's production is exported, but its value is considerable: In 1981, Peru exported US$ 2 million of sawn wood from Pucallpa (CORDEU et al. 1982). This only represented 2.7% of the total industrial timber production of Pucallpa, but it accounted for 73% of all the exported sawn wood that year (INRENA 1994). More recently, in 1994, Peru exported more than US$ 20 million of wood products, 90% as sawn wood (Barents & Trivially 1996).

Logging in Ucayali does not operate by clear-cutting, but by selective extraction. Out of the 2,500 woody species estimated in the Amazonian lowland forests, only six species[14] make up 90% of the extracted volume in Ucayali (CORDEU et al. 1982, Barents & Trivelli, 1996). Indeed, while the estimated average commercial volume of the Ucayali forests is 100 m^3/Ha, only 5 to 7 m^3/Ha are normally extracted[15] (Iturraran 1988, cited in Barrantes & Trivelli 1996). Up to 90% of extraction is performed by ill-trained, informal loggers with a chainsaw. Logs are taken to sawmills in Pucallpa, mostly by river, where they are turned into sawn wood, plywood, and flooring tiles. Then, these products are transported to Lima by road, and commercialized in that city.

Vertical integration between extraction, transformation, transport, and commercialization is very weak. Consequently, costs are high and inefficient, there is a permanent conflict of interests between subsectors, and each subsector is grossly over-dimensioned[16]. In 1994, the sawmills in Pucallpa were working at 40% of their capacity, a chronic feature of the industry (Barrantes & Trivelli 1996). The situation is worsened by the strong dominance of the activity by commercial companies based in Lima. For instance in 1981, when sawn wood exports from Ucayali reached a peak, 96% of the exported volume was channeled by commercial companies in Lima, with two of them (owned by the same investor group) concentrating 50% of the volume. An astounding 96.6% of the value of the exported sawn wood from Ucayali stayed with companies in Lima (CORDEU *et al.* 1982).

Due to a lack of quality standards, inadequate machinery, and unskilled labor, selective logging is wasteful and performed with extensive damage of extracted and not extracted

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[14] Cedro (Cedrela odorata), caoba (Swietenia macrophylla), tornillo (Cedrelinga catenaeformis), lupuna (Ceiba pentandra), catahua (Hura crepitans), and copaiba (Copaifera reticulata).

[15] Large contractors are even more selective, extracting only 3 to 5 m^3/Ha (F. Razetto, President of the National Chamber of Foresters, pers. comm. in Barrantes & Trivelli 1996).

[16] This is the expected phenomenon in the exploitation of open access resources (Pearce and Turner 1990).

trees. A 1987 study found that only one out of every five log sections arriving to the sawmills in Pucallpa could be considered sound: 48% of logs were cracked, 23% bent, and 7% had significant holes (Gauthier 1987, cited in Barrantes & Trivelli 1996).

In the 1980 -1992 period 2,398,478 m^3 of sawn wood were produced in Ucayali (INRENA 1994, 1995a, 1995b). Assuming a very conservative 30% of losses during transformation, they represent 3,118,021.4 m^3 of logged wood. Not considering losses in extraction and transportation (but see above paragraph), and assuming a high-end estimation of 7 m^3 extracted per Ha of natural forests, only sawn wood would represent at least 445,432 Has of forest degraded by the timber activity in Ucayali in twelve years, or about 4% of the region's territory. However, selective logging has occurred at the above recorded levels for at least three decades.

Thus, however one makes the calculations, we can safely say that more than one million hectares of forest have been logged and degraded in the last 30 years in Ucayali (a full 10% of the region). This is an enormous expanse of land. However, the ecological and economic impact of this activity is largely unrecognized, as if the trees, once cut-down and commercialized, had turned invisible. This invisible forest has subsidized an important fraction of the economically active population of Ucayali for half a century and continues subsidizing the economy of the region.

In order to stop the waste and buy time for reordering the activity toward greater economic efficiency, the Peruvian government has recently issued several policies regarding timber exploitation. Since 1992, a moratorium on new contracts of timber exploitation is in place. In 1995 the reforestation tax to timber extraction in Ucayali was increased in 115% for class A and in 80% for class D hardwoods. Also, the Regional Direction of Agriculture has banned several river basins to timber exploitation. The moratorium, the increased taxes, and the bans, if anything, make more acute our perception of an "invisible forest". We can see truckloads and rafts of logs in the streets and the river port of Pucallpa on a daily basis. However, since timber exploitation is supposed not to be happening (or it should be decreasing), this timber seems to pass largely unrecorded. In an official recognition of the invisibility of the activity, the agricultural census of 1994 does not provide **any** direct information on timber exploitation in Ucayali. Since timber extraction was largely banned or heavily taxed, informal loggers had an incentive to identify themselves as agriculturists, and their logging lands as agricultural. Therefore, we may also suspect an over estimation of croplands and farmers in the census.

The Invisible Crop

The main crops of Ucayali, in order of cultivated surface, are plantains and bananas, manioc, rice and grain corn. However, the total area in coca fields for the production of illegal cocaine was greater than the total area of plantains and bananas between 1994 and 1996 (INEI 1995b; USAID/US Embassy 1997). Interestingly, in 1996 there was an increase in cultivated area of plantains and a decrease in coca cultivation. Both phenomena reversed decade-long trends. Therefore, the domination of coca very likely has existed at least since the early 1980s.

Considering its particularly high price, coca for cocaine could be regarded as the most important crop in the agricultural history of Ucayali. However, due to its illegal and clandestine nature, the contribution of coca to the farmers and to the regional economy has been mostly unrecorded and unresearched.

Still, it is most likely that coca has significantly subsidized the colonist society of Ucayali during most of the last two decades. Indeed, at least one internationally-funded agricultural development project in the 1990s survived due to a inflow of farmer earnings derived from coca cultivation. When the Peruvian government strengthened its persecution of cocaine labs and dealers, farmers became unable to repay the project's credits, and the project failed (Elena Trigoso, President of AMUCAU[17], pers. comm. June 1998).

Although all official reports claim that coca production in Ucayali is decreasing in the last few years, several field-experienced professionals working in the region claim that production has migrated and dispersed like a metastasis from its traditional area in Aguaytía, increasing but becoming much more difficult to identify and monitor.

Cattle and Fish

During the 1980s, the Peruvian government enthusiastically subsidized the production of rice and corn monocrops as well as cattle ranching in the Amazon (Labarta 1997). Cattle ranching in the Amazon has been stimulated by national and international R&D organizations since the 1970s. In a vivid example of the concept of development that inspired cattle ranching in the Amazon, K. Santhirasegaram, a tropical forage expert from FAO who visited Pucallpa in the early 1970s and largely laid down the research program for the following 20 years, wrote: "Such conditions as the complete removal of the climax vegetation are unavoidable, and are the basis of our civilization" (Santhirasegaram, 1973).

According to the agricultural census of 1994 (INEI 1995b), a total of 106,081 Ha of pastures exist in Ucayali, 98% of them concentrated in the Pucallpa sub-region. Twenty years ago, about one third of the pastures were dominated by native and introduced grasses of low productivity. However, by the early 1980s, thanks to the efforts of Peruvian and international institutions, it was already apparent that a selected grass, Brachiaria decumbens, was dominating Ucayali's pastures. In 1994, according to the

[17] Ucayali's Peasant Women Association (*Asociación de Mujeres Campesinas de Ucayali*).

Agricultural Census, 97% of the pastures in Ucayali were exclusively selected Brachiaria.

In spite of the improvement of the pastures, Ucayali's livestock production is extremely low. In the benchmark site, only 1 out of every 5 farmers who have pastures actually owns some cattle (Fujisaka 1997). Cattle production reached a peak in the mid 1980s, in response to President Alan García's aggressive incentive policy, but it has declined since, apparently by the combined effect of the dismissal of subsidies, the increasing political violence toward the end of the 1980s, and the coca boom.

Arguments have been repeatedly advanced in favor of stimulating double-purpose cattle production in Ucayali (e.g., *Acción Agraria* 1998). The rational for this proposal is double: First, there is a large expanse of under-used pastures which productivity could be enhanced by improved grass-legume combinations. Second, there is a milk-and-beef deficit in Ucayali and the nation.

Due to the extremely contentious nature of the issue, it is reasonable to inquire what are the goals that may be accomplished by increasing the numbers of cattle in an Amazon lowland. While a reduction of wasted pastures and the enhancement of their productive potential are probably desirable outcomes, particularly if part of integrated farming systems, cattle represent a stiff investment, out of reach for most small farmers, and it is *not necessarily* the optimum livestock species for the ecological-economic conditions of the benchmark site. The available evidence strongly suggests that the growth of the cattle herds in Ucayali was a largely subsidized phenomenon that mostly favored a handful of large investors and became rapidly unsustainable when subsidies decreased. Even the advocates of extensive cattle ranching in the Peruvian Amazon recognize that the activity needs to happen in large operations to achieve economies of scale that justify the investment (Acción Agraria 1998). Therefore, the development value of extensive cattle ranching for small farmers is, at least, unclear.

The argument of a milk-and-beef deficit is even more troublesome. In order to develop this argument we must first accept the assumption that beef and milk are basic or irreplaceable resources for human nutrition in the region or the nation, or must demonstrate a significant market demand for those products in the region. This is far from granted. The only significantly large market for beef-and-milk is Lima. While Peru's production does not meet the national demand, and there is evidence that the Lima market suffers a deficit of milk-and-beef, the high production and transportation costs from Ucayali make beef-and-milk from the region non-competitive. At the regional level, there is a number of foods, many of them native, that can replace beef and milk with much smaller ecological impact and economic investment.

In particular, freshwater fish taken from rivers and lakes without major ecosystem transformation actually are the main source of animal protein in Ucayali. Fish production in Ucayali is about ten times beef production, averaging 8,000 MT/yr. (Saavedra 1996, 1998). Fish provides high-quality protein to the urban majority and the riverine human population of Ucayali. Although there are not published records, apparently wild game and other forest animals provide the main animal protein to the upland rural population (Oscar Vásquez[18] and Marco Romero[19], pers. comms. 1998).

[18] Regional Direction of Agriculture, officer in charge of the Campoverde sector.
[19] MADEBOSQUES Project, Executive Director.

Although fish are produced in larger quantities, they are consumed directly or sold at significantly lower prices than beef. Therefore, the contribution of fisheries to the regional GDP is very small. The watery ecosystems that produce the fish subsidize the livelihood of most city-dwellers and an important proportion of the rural human population of Ucayali. However, its small apparent economic contribution, the marine bias of the fisheries sector in Peru, and the divorce between the health, the agricultural, and the fisheries sectors in the region tend to make freshwater fish and their ecosystems, again, largely invisible.

As for milk, several studies conclude that most peoples with Amerindian genetic background (including mestizos) develop non-reversible hypolactasia by four years of age. Thus, they cannot consume non-transformed milk, although they can consume cheese and yogurts. (See Paige *et al.* 1972 for Peru; see Sahi 1994 for an updated review) The population of Ucayali are mostly mestizos of strong Andean or Amazonian indigenous ancestry. Last February, we interviewed Ms. Lucy Noriega from the Nutritional Support Program in Ucayali (PRONAA), which provides milk-based food reinforcements to school children (the famous "*vaso de leche*"), and she confirmed to us that they recorded problems with lactose intolerance at the beginning of the program. Although she dismissed the issue as one that stopped occurring after a while, this seems highly unlikely, given the genetic nature of hypolactasia. It is more likely that affected children stopped consuming the milk-based reinforcements or that the problem continued unrecorded. Thus, plans to increase the dietary intake of milk in the region should also include the transformation of milk into cheese or yogurt.

In spite of the dietary contribution of fish and forest animals, varied evidence suggests that undernourishment, particularly chronic child undernourishment is high and increasing among the rural population of Ucayali. An important part of rural malnutrition may be related to a lack of high-quality protein in the diet. Growing concerns on the declining status of fishing stocks in the Ucayali basin, particularly the large and preferred species, have stimulated the development of aquacultural technology for native species by IIAP. Although this technology is already developed and available, its relative complexity and the high costs of growing compared to catching fish have led to very meager adoption, particularly by small farmers. Also, there is evidence that forest game is largely over-hunted and scarce, particularly in the Pucallpa sub-region. Therefore, it makes sense to look at on-farm animal production as a strategic source of food security in the region. However, what system of animal production is best fitted for the small farmers of Ucayali is still an open question.

CONCLUSIONS

The general conclusion of this discussion is that Ucayali is an open, multi-scale, and dynamic ecological-economic system. It cannot be effectively understood or sustainably modified if research and interventions concentrate in one sub-region and exclude interactions with other sub-regions. It cannot be effectively understood or sustainably modified without a careful monitoring of its larger-scale constraints and determinants. It cannot be effectively understood or sustainably modified if research and interventions concentrate in one short-time period. Specific conclusions are:

- The Pucallpa sub-region and the benchmark site are not isolated areas. Their socioeconomic dynamics depends to a large extent of activities and resources that

happen outside the sub-region and the benchmark site themselves, and that are not strictly agricultural in nature.

- The agricultural development of the Pucallpa sub-region and the benchmark site depend historically of a heavy subsidy from nature, transient economic booms, and different forms of government subsidies; these factors are largely exogenous to the sub-region's systems of crop and livestock production, and to the regional markets.
- Centralism and institutional instability in Peru and net economic outflows from the region determine important structural constraints to economic growth and development anywhere in Ucayali. We suggest that a low-ceiling for development exists in the region. This low-ceiling will limit significant impact of agricultural R&D if it is not integrated with basic organizational and economic solutions.
- Small farmers in Ucayali are poor in capital (and probably also in labor). They face a complex set of external difficulties that preclude the enhancement of productivity, economic growth, and development. Difficulties include lack of access to credit, technical support, and markets. Therefore, agricultural technology alone is highly unlikely to obtain significant impacts on farmers' wellbeing.
- There are still important gaps and a number of entrenched prejudices in our understanding of small colonist farmers in the region, particularly in terms of their socioeconomics, culture, knowledge, and decision making. A crucial aspect of this problem relates to the opportunistic, diversified economic activity of the farmers, and how they obtain a living by securing access to off-farm resources as well as on-farm non-agricultural resources. Effective R&D must build upon the productive mosaic faced and managed by farmers.
- Available productive on-farm technology among national and international institutions seems insufficient and is sometimes inadequate for small farmers. An important effort in adaptation and integration of technologies is needed.
- Participatory approaches to R&D are extremely new in the region, current activities are largely unaware of existing local expertise, and still show strategic limitations (e.g., gender bias that underestimates the role of women in farmer family production and wellbeing).
- Integrated approaches (even technological) to R&D are still missing.

RECOMMENDATIONS

Given the high stakes at play, a permanent critical revision of the priorities and interventions of applied research in Ucayali is called for. From the above discussion, we dare to suggest that applied research on agriculture and natural resource management will significantly contribute to the sustainable development of the benchmark site only if at least two key conditions are met in the determination of priorities and interventions.

First, research must be explicitly oriented to empower regional actors and increase the proportion of value added that is generated and reinvested in the region (in our case, local small farms). This calls for a participatory approach in the determination of research priorities and the strengthening of local organizations at different levels, but with a major emphasis in the grassroots. The main objective of interventions should be the increase of self-sufficiency and on-farm security among small farmers.

For commercial production, the local empowerment condition implies the need for a careful selection of products and markets that must simultaneously meet the criteria of low risk and increased revenues for the local producers. We are far from

underestimating the challenge represented by this consideration. Specific ways of meeting the challenge include:

- further research on land-use policies and their impact on sustainable development in the region;
- further research on interactions between poverty, land use, and ecological degradation in the Pucallpa sub-region (already under way);
- building a shared local database of national related initiatives, organizations, and individuals in the region, and using it to identify expertise and strategic alliances in areas not supported by the CG centers;
- development of initiatives specifically aimed to the strengthening and creation of local grassroots organizations, such as producer cooperatives, with self-sufficiency as their primary goal;
- further development of formal strategic alliances with local NGOs and R&D institutions, specifically aimed to strengthen those organizations and building a critical mass of participatory expertise in the region.

Second, effective research must efficiently integrate biophysical and socioeconomic disciplinary perspectives. Special attention must be paid to the subsidy from nature represented by timber, fish, and forest game and firewood. These extractive natural resources play a strategic role in supporting the growing human population and providing resilience to the system. A crack-down of these life-supporting resources would inevitably have catastrophic consequences.

Possible paths of integrated participatory research, in order of increasing specificity, include:

- further development of integrated participatory research methodology;
- the implications to sustainable development of social relations and decision making among small colonist farmers, with an emphasis in gender relations and cooperative networks; and
- the development and application of integrated agricultural production systems for the sustainable solution of health and food security problems among small colonist farmer families.

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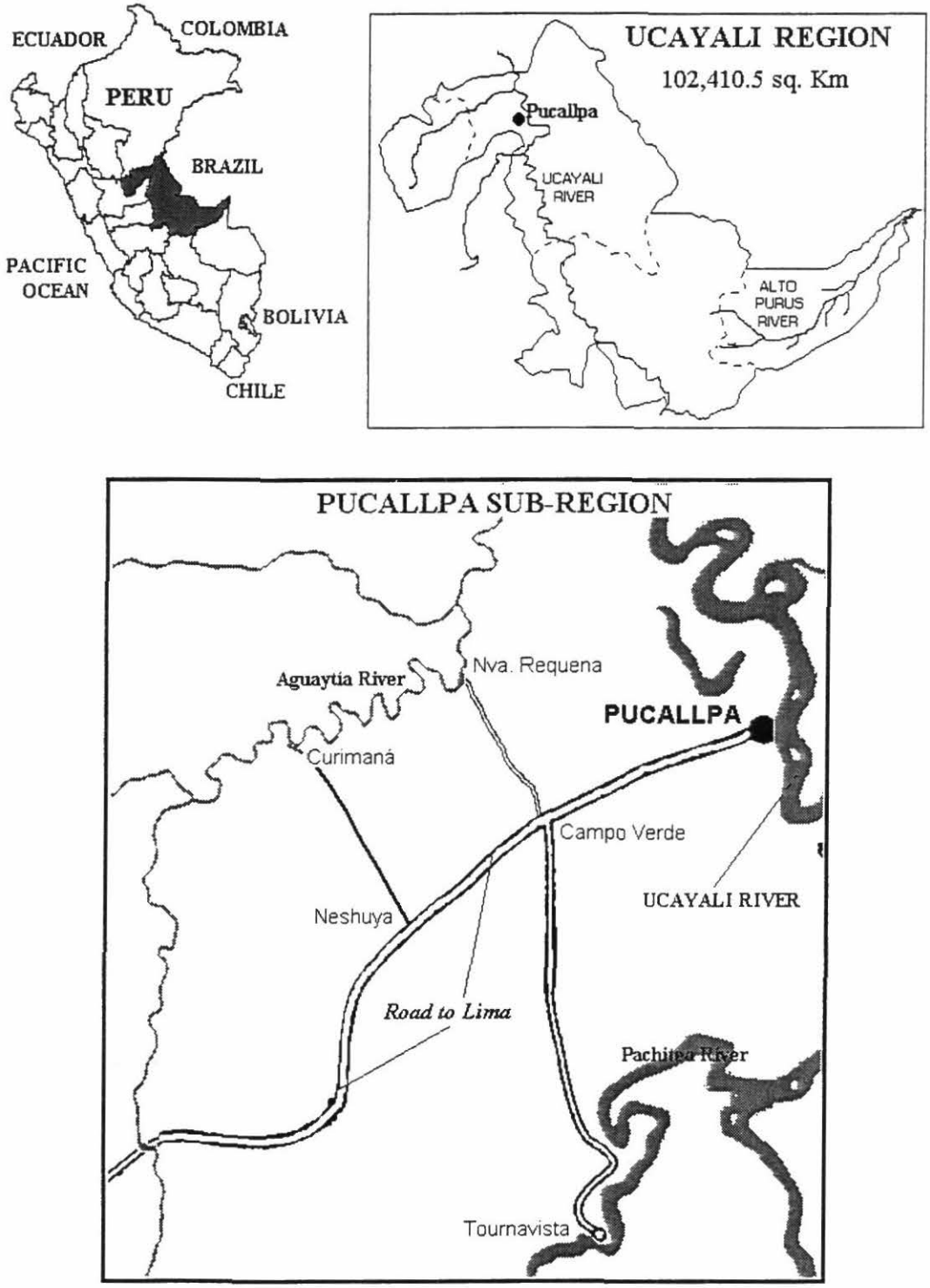


Figure 1. The Study Site.

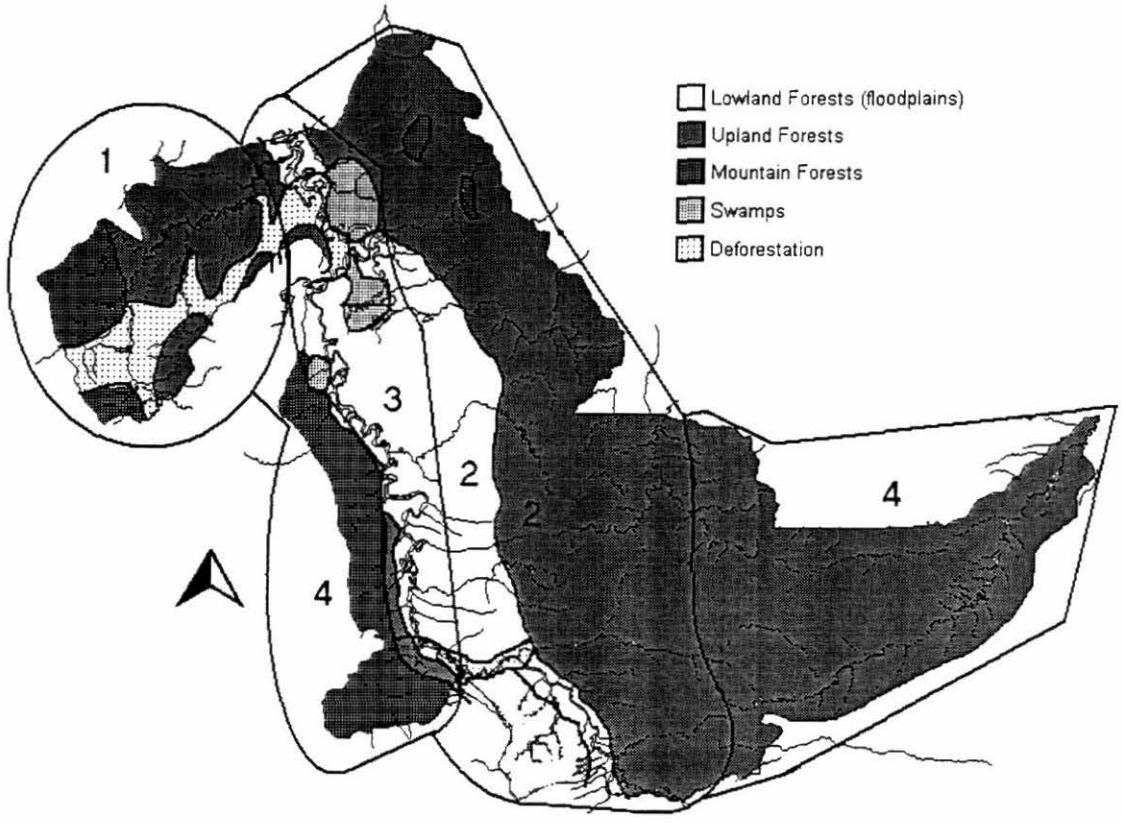


Figure 2. Major landscape units and sub-regions in Ucayali. 1: Pucallpa sub-region; 2: Timberlands; 3: Floodplain and wetlands; 4: Isolated forests. Sub-regions overlap and have dynamic boundaries. Boundaries in the figure are only referential.

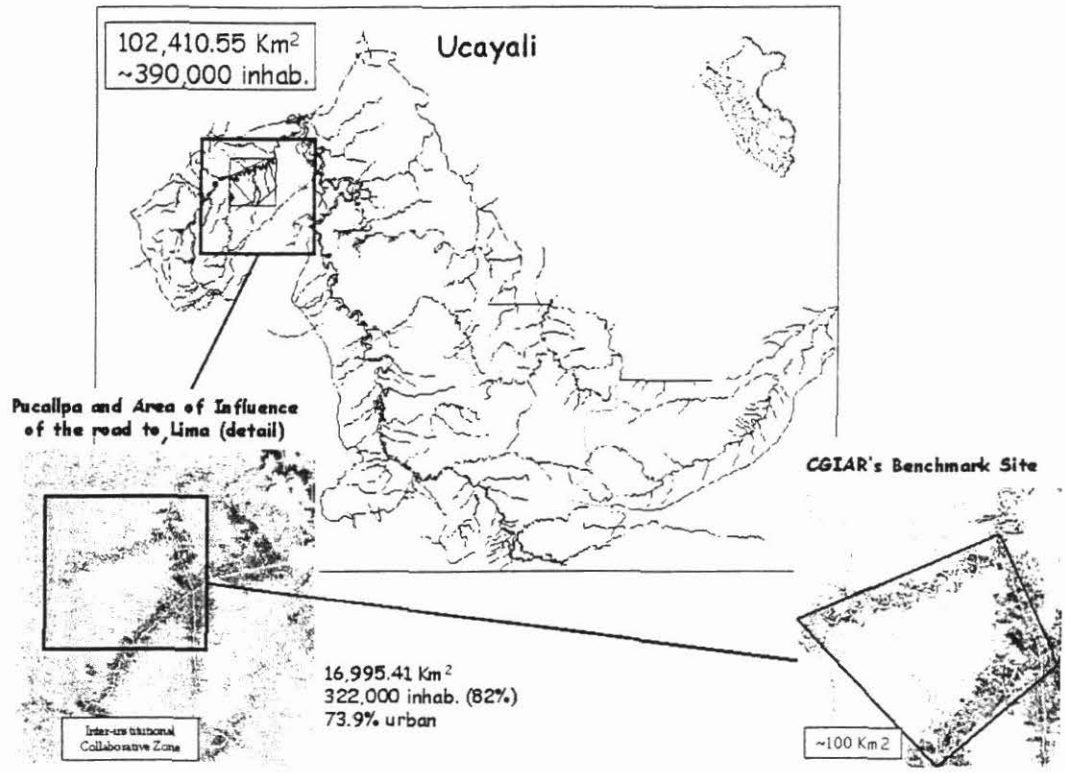


Figure 3. The Ucayali region and the CGIAR's benchmark site.

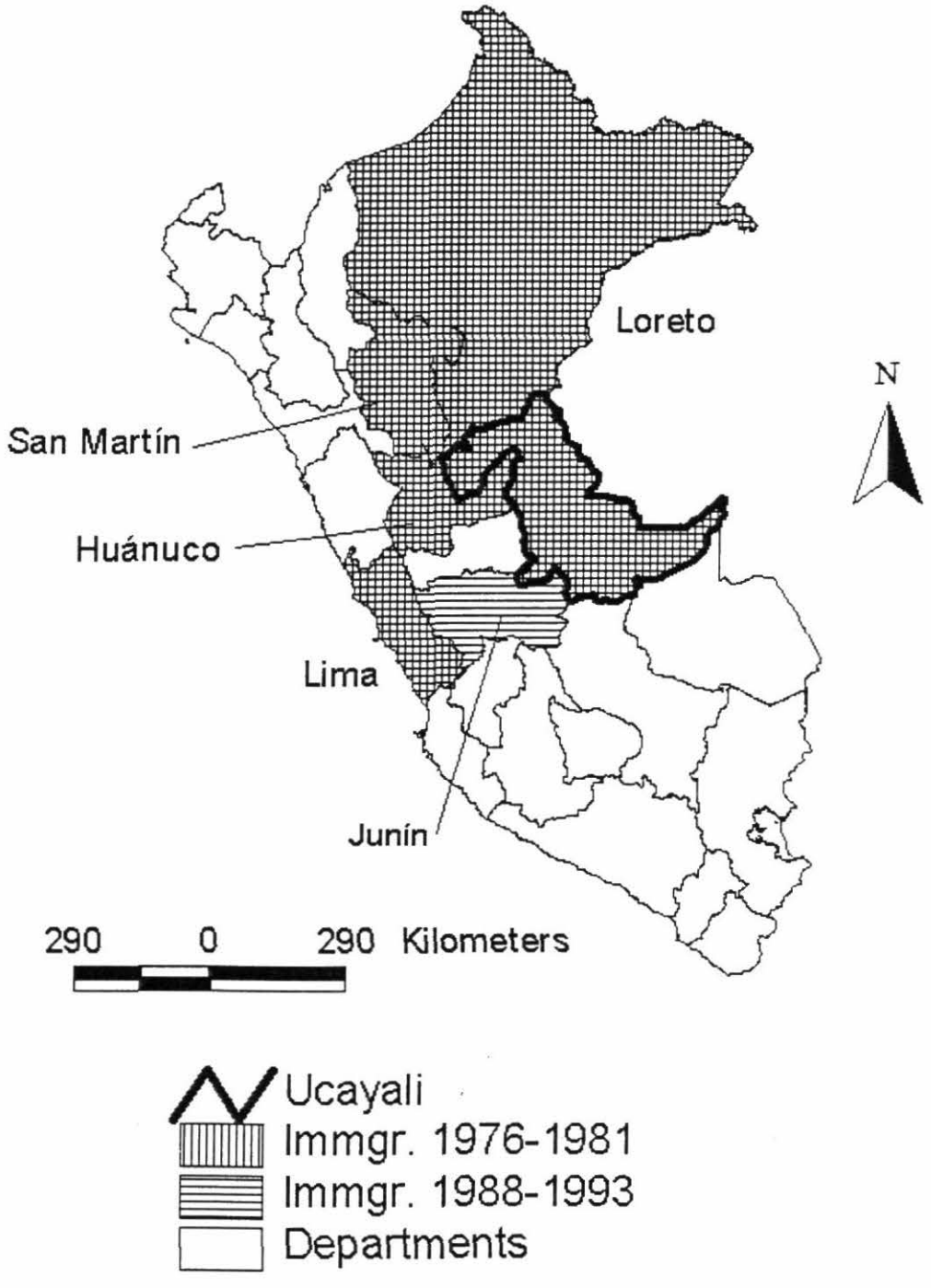


Figure 4. Colonization of Ucayali 1976-1981 and 1988-1993. Flows greater than 1,000 people.

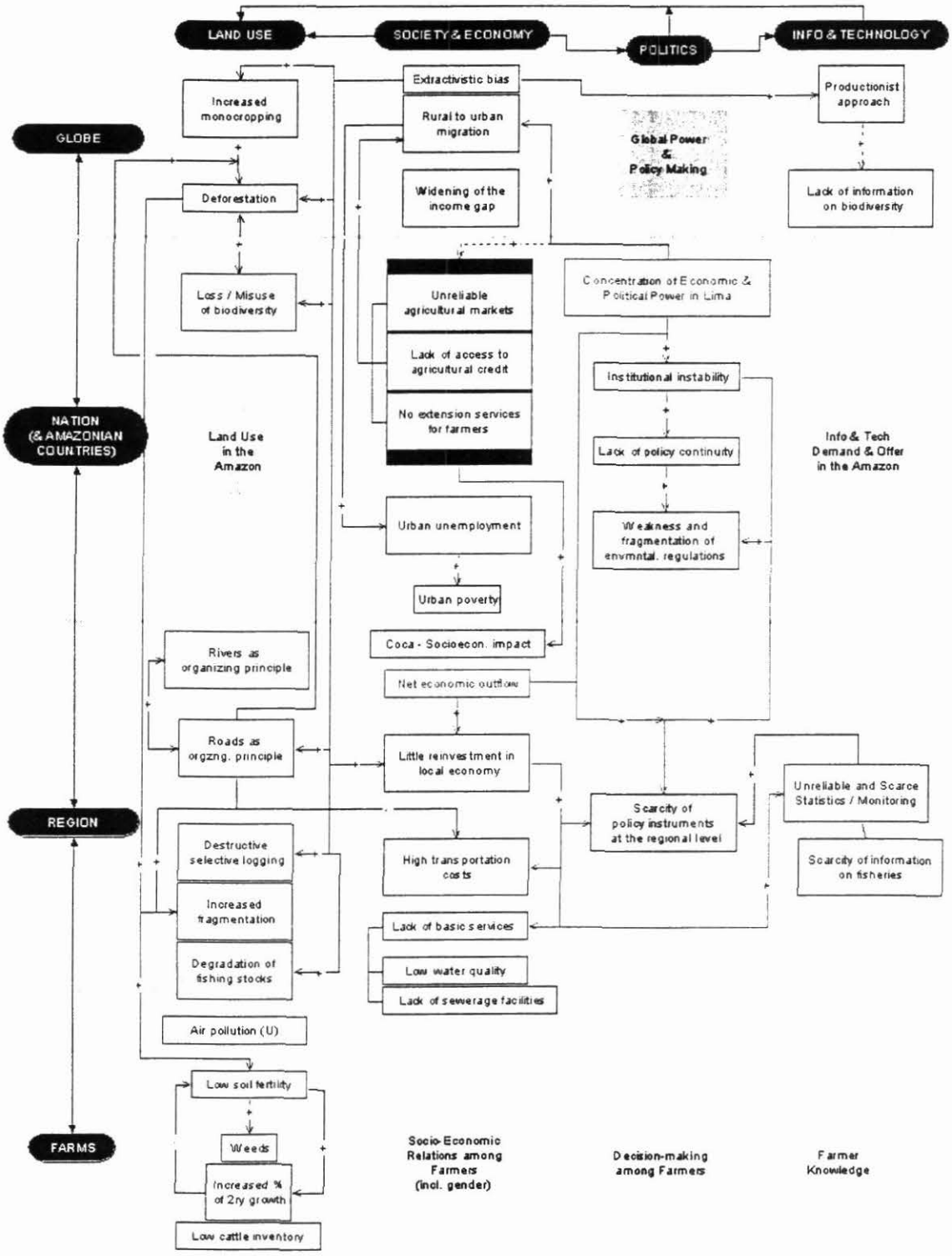


Figure 5. Issues in Ucayali. Influence diagram.

Outputs 2.2.1/1.2.4.
Organizational models for decentralized research and tools for stakeholder analysis

Collective Action in Watershed Management - A Participatory Action Research Project in the Andean Hillsides

Olaf Westermann

Main achievements:

- User feedback on decision-tools for natural resource conservation at watershed level
  - Decision-making tool for natural resource management elaborated and presented (link with PE-3)
- User feedback on NRM technology and prototype production systems (link with Interprogram project)
- Methodology for participatory systems trial at the landscape level with groups of stakeholders
  - Control of leaf cutting ants with lorsban and lime
  - Trials with early maturing maize varieties for management of *Macrodactylus ovaticollis*
  - Control of soil erosion with sugarcane, rice and grass live barriers
  - Reforestation of springs
- Organizational models for facilitating user participation in analysis of and research on NRM issues
  - methodology to identify stakeholder groups and to stimulate collective management of natural resources in micro watersheds completed

OVERVIEW

Watershed management involves the integrated management of a multitude of common and privately owned resources such as cropland, pastures, forests and water. In the Andean hillsides, farms are generally small, and the population is characterized by great cultural, religious, and economic diversity. Watersheds in this region are managed at the level of numerous individual and independent holdings rather than in a concerted fashion with a view to entire landscapes. As a result, in their day-to-day management of natural resources, farmers may lose sight of important watershed properties, such as soil and water flows, landscape structure and the existence of habitats for particular species.

As part of its interdisciplinary research, CIAT's Hillsides and Farmers Participatory Research and Gender Analysis projects are working in two, small multi-ethnic watersheds (Los Zanjones and Guadalito) in the Andean hillsides of southern Colombia. The objective of this work is to find ways to foster collective or concerted action among watershed users and other stakeholder groups in their day-to-day management of natural resources and thereby enable them to deal with problems that cannot be solved effectively by individuals acting alone. So far, this work has dealt with problems related to water management and conservation, erosion control, and pest control (white grubs and leaf cutting ants). The accomplishment of these initiatives are indicators of success, although the actual impact on the management of natural resources still has to be evaluated.

The project has been focused on the development of a methodology to identify stakeholder groups in order to accomplish collective management of natural resources in micro watershed[20]. The rationale for developing a stakeholder analysis methodology for micro watersheds arose from a practical experience in other parts of the Rio Cabuyal Watershed. The decision made by the watershed users organization FEBESURCA (now ASORBESURCA) to stop the burning of forests around natural springs, was violated as a result of not all stakeholders being included in the decision-making process. ASORBECURCA recognized this and invited more stakeholders to participate in the analysis and exploration of possible alternatives. This incidence triggered our research on a methodology that recognizes all stakeholders and identifies contrasting perceptions through a sequence of individual interviews and meetings.

1. Collective management of natural resources

The research aims to identify key elements in fostering and facilitating collective action for watershed management and is producing a set of handbooks on key issues, such as stimulating interest in collective watershed management and stakeholder identification aimed at NGO's and other agencies working in natural resource management.

Verifiable Indicators:

- User feedback on NRM technology and prototype production systems
- Methodology for participatory systems trial at the landscape scale with groups of stakeholders

Activities

- Evaluation of ongoing collective action activities
- Identification of future work priorities
- Strengthening of ongoing collective action activities
- Create and strengthen watershed users organization (capacity building)
- Review of literature on collective action with specific emphasis on landscape management and scaling up (to be completed)

Highlights:

- Through FPR methods the combination of lime and lorsban has been identified as an effective means of control of leaf cutting ants
- Farmers have evaluated and planted live barriers against soil erosion. The biophysical effect still has to be evaluated.
- Together with researchers farmers have done trials aimed at identifying maize varieties resistant to *Macrodactylus ovaticollis* Bates
- Reforestation of natural springs has been initiated

[20] Watersheds are bio-physically delineated on the basis of topography and waterflows. Watershed can have many sizes but we have defined our micro-watershed to be within 25-150 hectares.

Highlight 1

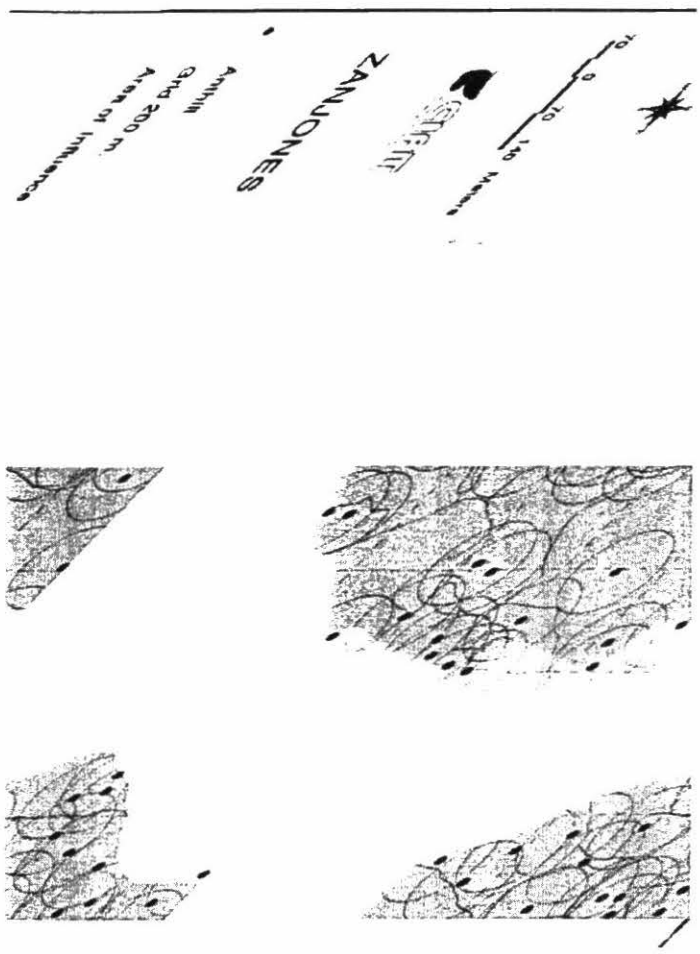
Through FPR methods the combination of lime and lorsban has been identified as an effective means of control of leaf cutting ants[21]

The experiment took place in the micro-watershed, *Los Zanjones*, situated in *La Laguna* in the Andean hillsides in southwestern Colombia. *Los Zanjones* comprises 44 hectares, subdivided among 14 individual owners, giving an average plot size of 3.1 hectares. An anthill inventory, conducted with the owners in 1997, identified 39 anthills or nests. Map 1 shows the extensions of the 14 plots, overlaid by the location of the 39 nests. On the basis of farmers' experience from a number of anthills in the area, the average radius of action of the leaf-cutting ants, that is the distance from the nest that the ants move to forage, was estimated at 80 meters. A circle with a radius corresponding to 80 meters has therefore been drawn around each nest in map 1 to indicate their areas of influence. As it can been seen the ants transcend farm boundaries and collective action to control the ants is necessary to achieve a significant impact of the control.

Four possible alternative control methods and a control (no treatment) were selected for farmer experimentation in *La Laguna* for control of existing anthills. These are:

- agricultural lime, pumped into the anthill
- lime mixed with *lorsban*, pumped into the anthill
- gasoline, poured into the anthill and set fire to in order to produce an explosion
- washing powder, poured into and around the entrances/exists of the anthill

[21] Source: Ravnborg, H.M. "Collective Action in Ant Control', forthcoming



Map 1. Location of anthills, their radius of action and farm boundaries, *Los Zanjones, La Laguna*, Colombia

Table 1 shows the results from the ant control treatment in Los Zanjones

TABLE 1:

Treatment	Anthill number	Number of holes at first application /monitoring visit	Number of holes at last application/ monitoring visit	Total number of applications	Percent reduction in number of holes
Washing powder	1	44	7	7	84
	2	135	20	9	85
	3	25	43	9	(-72)
Lime	4	109	1	10	99
	5	257	18	9	93
	6	22	26	9	(-18)
Lime + *lorsban*	7	70	3	7	96
	8	25	0	3	100
	9	13	0	4	100
Gasoline	10	8	0	2	100
	11	35	0	2	100
	12	102	0	3	100
Control (no treatment)	13	30	6	N.A.	80
	14	8	6	N.A.	25
	15	17	9	N.A.	47

Highlight 2

Farmers have planted live barriers against soil erosion. The biophysical effect remains to be evaluated.

Live barriers of rice, sugarcane and pasture have been sown in the mini-watershed Los Zanjones. In total, 382 meters of pasture, 318 meters of rice and 971 meters of sugarcane have been sown.

Farmers opted for planting the live barriers in order to improve soil fertility, i.e. to reduce erosion and promote the building up of organic matter/humidity.

Asked about what would be their indicators for evaluating whether the barriers were serving their purpose, farmers mentioned the following possibilities:

- that the plants in between the rows would grow better
- on the other hand, if the soil looks 'bright', it is getting tired
- that there wouldn't be any gullies
- that the soil would be flat

An activity that has been initiated to evaluate the erosion control effect of the live barriers involves using equipment to measure changes in the shape of the slope.

Highlight 3

Together with researchers farmers have conducted trials aimed at identifying maize varieties resistant to *Macrodactylus ovaticollis* Bates.

To determine if the phenology of maize could serve as a basis for management of pests, comparisons of 10 genotypes of maize were made. 8 lines of "maiz blanco" and 2 local variants were tested. Dates were collected in relation to the time of flowering, ripening, adaptation to the environment and the damage done by *M. ovaticollis*. The flowering of 5 lines with maize blanco and the local varieties coincided with the maximum presence of *M. ovaticollis*. As a result nearly 50% of these maize varieties were damaged. On the contrary 3 of the lines evaluated (SEW-HG"A", SEW-HG"B", and SEW-HG"AyB") flowered before the population peak of *M. ovaticollis*. Only 8.6% of these maize varieties were damaged. The conclusion is that the use of early maize varieties could serve to reduce impact from *M. ovaticollis* infestation.

Highlight 4

Reforestation of natural springs has been initiated

Farmers have taken the initiative to plant *guadua* (bamboo), and the tree species, *canelo* and *nacedero* around the springs. The work has been organized as *mingas* but only few of the farmers have participated. Furthermore the decision to plant the trees and the sort of trees to plant were taken by few members of the micro watershed. Thus some owners of the land down to the springs have removed the trees because they think that e.g. *guadua* will provide shadow for the coffee. Another example that illustrates that problem resolution of natural resource management problems requires the involvement of as many stakeholder as possible.

Rationale:
Some problems of natural resource management cannot be solved on the farm or plot level but has to involve some sort of collective or concerted management of natural resources at the level of landscapes. This is especially true for management of natural resources in watersheds where water, soil and nutrient flows are evident (from the top of the watershed to the bottom of the watershed) and in relation to pests which easily cross boundaries.

Discussion:
Though it is evident that there are some problems the farmers cannot solve individually, organization around collective action is not easy. Transaction costs may be to high especially in watershed selected by the size and number of families and not selected by type and importance of natural resource management problems. Furthermore concerted action may demand organizational skills the farmers, and researchers, do not have.

Finally, inherent conflicts, which have nothing to do with the actual management of the natural resources, may hinder communication and collaboration among the farmers. This may be especially true when working with natural and not socially defined groups of natural resource users[22]. Stakeholders defined by the use of natural resources will not have social relations or norms that can motivate or force the actions of the individual farmers.

2. Methodology to identify stakeholder groups and to stimulate collective management of natural resources in micro watersheds

Verifiable Indicators:

- Organizational models for facilitating user participation in analysis of and research on NRM issues

Activities:

Testing the stakeholder analysis methodology in the micro watershed of Guaicoche. Review and completion.

Highlights:

- The methodology applied serves to identify maximum variation in perceptions and contrasting opinions on use, problems and conflict over natural resource management (see annex 1 and 2 for steps and diagram of the methodology).
- The methodology serves to stimulate some degree of collective management of natural resources among watershed users, because it opens a public space for analysis and negotiation of natural resource management problems.

Rationale:

In most projects with participatory approaches, stakeholder identification and gender analysis is applied to reach normative goals like benefiting the poorest and equity. Projects dealing with collective management of natural resources stakeholder identification may have the same purpose. However, a basic assumption for our project is, that to achieve a real impact of collective management of natural resources all stakeholders have to be identified and invited to become involved in decision-making processes and negotiation. Thus stakeholder identification does not only become a normative goal but a precondition to the activities and impacts of collective management of natural resources.

Discussion:

Collective management of natural resources implies a broad range of activities of which stakeholder identification is one. Thus the development of the stakeholder methodology is only a step forward towards a more comprehensive understanding of which actions

[22] Stakeholders are defined by interest. Interests are often associated with social relations like ethnicity, gender, age, and culture or defined politically or administratively like municipalities, regions etc. Working with the collective management of natural resources we find it relevant to define stakeholders due to their interdependency in use and management of natural resources. As such watersheds (and other landscapes) becomes the boundaries of our work and the stakeholders defined by their interdependency of the natural resources within this bio-physical boundary. These stakeholders may belong to different social and political defined units but all have an interest or "stake" in the same natural resources.

and structures motivate and facilitate collective management of natural resources. Among the issues the methodology does not deal with successfully are:

- How to involve all interest groups in collective activities?
- How to create a forum for negotiation where all stakeholder groups (when identified) can and will participate?
- How to resolve conflicts?
- How to organize farmers groups to design collective activities?

3. Decision-making tools for natural resource management in watersheds

Indicators:
User feedback on decision-making tools for natural resource management at watershed level

Activities:
- Test of training material in Yorito, Honduras (May 28-29)
- Workshop in Yorito (June 13-17)
- Workshop in San Dionisio, Nicaragua (August 1-5)
- Training workshop in Nicaragua (October 26-29)
- Training workshop in Danlí, Honduras (November 2-6)

Highlights:
- Participation was active and responses to the methodologies were positive. The following are comments from some of the evaluation reports :

"The information presented is very important."
"In future work we will try to apply the methodology."
"This methodology is of great interest to me and my institution as we already work with farmers groups."
"This training allows me to perform my work better."

- Participants are requesting material on the methodologies presented.

Rationale:
It is necessary that we make an effort to disseminate the methodologies CIAT has developed to potential user (link to PE-3).

Problems and Constraints:
The Collective Action Project has investigated how to solve transboundary[23] problems of natural resource management through people's concerted or collective management of natural resources. But how to stimulate, consolidate and particularly scale up these processes is still not sufficiently understood. A great challenge then is to continue research on collective action in the micro watersheds and to learn from experiences elsewhere in the world. It would be obvious to do this within the context of collaboration

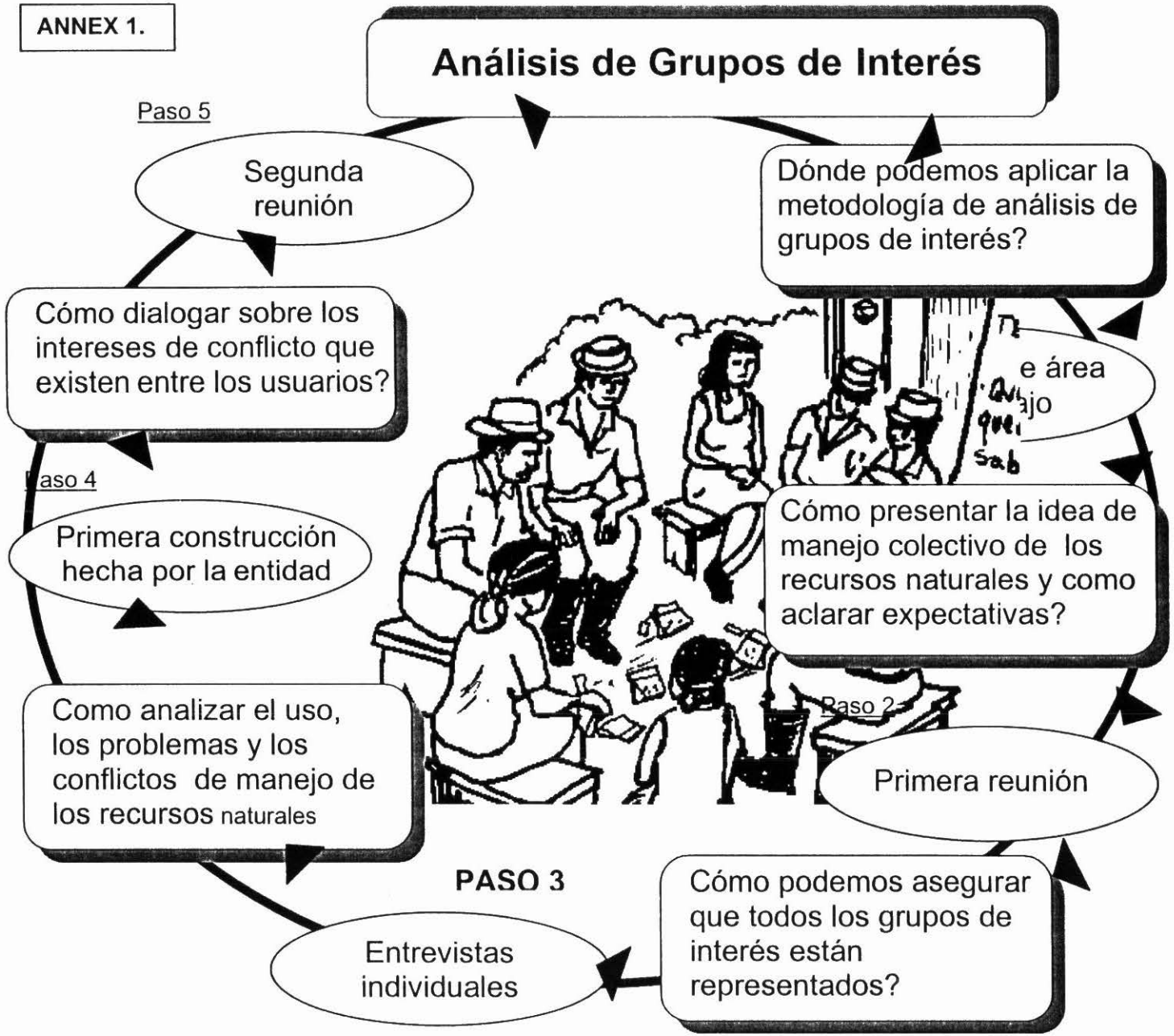
[23] Problems which causes and effects transcend field boundaries

between CIAT and other CGIAR-centers within the system-wide program on property rights and collective action.

The investigation can be said to contain the integration of social praxis and natural science and the collaboration between social scientists and natural scientists. Whereas CIAT is well positioned for this kind of integrated research, there remains a need to develop more truly interdisciplinary research programs. Such an initiative is currently being elaborated between CIAT and the Center for Development Research in Denmark dealing with the issues of land management (in collaboration with Helle Munk Ravnborg's Collaborative Research Program on Landscape Management).

Currently funding is received from Danida and IDRC and secured for 1998, but funding gaps for operational expenditures are foreseen for 1999. Over the next year the project will continue its current path of investigation while seeking to identify further research priorities, e.g. through impact evaluation of previous activities. It is likely that for the following two years, research issues will be focused on working with transboundary natural resource management problems where the resource boundaries define the geographical limits of the research area and not social organization. New initiatives could arise from the lessons learned from the analysis of landscape structures and the spatial interdependencies among natural resources and their use. Furthermore, this approach could also be used to determine the manner and extent of scaling up of the lessons already learned from previous work.

ANNEX 1.


Análisis de Grupos de Interés
Paso 5
Segunda reunión
Dónde podemos aplicar la metodología de análisis de grupos de interés?
Cómo dialogar sobre los intereses de conflicto que existen entre los usuarios?
e área
ajo
Paso 4
Primera construcción hecha por la entidad
Cómo presentar la idea de manejo colectivo de los recursos naturales y como aclarar expectativas?
Como analizar el uso, los problemas y los conflictos de manejo de los recursos naturales
Paso 2
Primera reunión
PASO 3
Entrevistas individuales
Cómo podemos asegurar que todos los grupos de interés están representados?

Annex 2 Análisis de Grupos de Interés Paso a Paso

Actividades y Objetivos	Criterios y Metodología
Selección de área de Trabajo ✓ **Facilitar comunicación directa** ✓ **Asegurar que existe la oportunidad de que los usuarios puedan reunirse cara a cara**	• **Area contiguas naturalmente** • **Entre 25-150 ha.** • **Entre 20-40 familias** • **Aclarar otros criterios de selección**
La primera reunión ✓ **Presentar la propuesta del proyecto,** ✓ **Estimular la apreciación de la importancia de la acción colectiva en el manejo de los recursos naturales** ✓ **Estimar la posible existencia de problemas con el MRN el micro cuenca.** ✓ **Identificar intereses de los usuarios**	• **Presentación del personal** • **Aclaración de expectativas y introducción al tema** • **Análisis colectivo del dibujo ficticio** • **Primera estimación de la posible existencia de problemas con MRN** • **Aclaración de contribución del proyecto** • **Sondeo de interés de usuarios por participar en proyecto** • **Propuestas para acciones futuras (segunda reunión y entrevistas individuales)** • **Agradecimiento y despedida**

Actividades y Objetivos	Criterios y Metodología
Entrevistas individuales ✓ **Escuchar todos los puntos de vista que existen** ✓ **Profundizar más en el análisis de los problemas y conflictos relacionados con el manejo de los RRNN**	• **Entrevista con familia seleccionada al azar(líder local, familia conocida etc.)** • **Análisis de ideas centrales, percepciones y preocupaciones en relación al MRN en la microcuenca para elaborar una primera interpretación.** • **Entrevista con familias con diferentes percepciones, señaladas por la primera familia. Presentación de la construcción basada en la en la entrevista de la primera familia.** • **Análisis de ideas centrales, percepciones y preocupaciones en relación al MRN para hacer la segunda construcción.** • **Entrevista con familias con diferentes percepciones, señaladas por la segunda familia. Presentación de la construcción basada en las entrevistas previas** • **Terminar entrevistas cuando las mismas familias resulten nominadas y no se halle mas variación.**
Primera interpretación sobre el uso y los conflictos ✓ **Comprender el uso de los recursos naturales** ✓ **Analizar los problemas del manejo de los recursos naturales** ✓ **Apreciar conflictos en relación de los recursos naturales** ✓ **Identificar grupos de interés**	• **Cuáles son los usos que se dan a los recursos naturales** • **Cuales son los problemas para realizar el uso que quieren a los recursos naturales** • **Cuales son los conflictos o desacuerdos que se hayan presentados en la cuenca** • **Cuales son los grupos de interés – cuales son los factores que definen los grupos de interés.**

Actividades y Objetivos	Criterios y Metodología
Segunda reunión ✓ **Dar voz a los conflictos que existen sobre los recursos naturales – sin comprometer a las personas entrevistadas** ✓ **Iniciar dialogo y discusión sobre uso adecuado de los recursos naturales**	• **Aclaración de expectativas** • **Presente de la interpretación hecha por la entidad** • **Discusión y modificación de la interpretación, en plenaria** • **Discusión y modificación de la interpretación, en grupos de interés** • **Unificación de las interpretaciones modificadas en los grupos de interés en una interpretación, en plenaria** • **Propuesta sobre acciones futuras** • **Sondeo final sobre el interés por parte de los usuarios por parte de los usuarios de la microcuenca en el proyecto** • **Compromisos y pasos siguientes** • **Agradecimiento y despedida**

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