Project PE-3
Communities and Watersheds

Annual Report
October 2004

COMMUNITIES
& WATERSHEDS
PROJECT

CIAT

PROJECT C&W

COMMUNITIES AND WATERSHEDS

ANNUAL REPORT 2004

CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

October 2004

Project C&W: Communities and Watersheds

CONTENTS

1. Research Framework

The Communities and Watersheds (C&W) Project is making progress toward the implementation of our research framework and principal outputs. Improved watershed management: land-water interactions (Output 1) is the primary focus of our CIAT/ Instituto Nacional de Tecnología Agropecuária (INTA) / Fundación para el Desarrollo Tecnológico Agropecuario y Forestal de Nicaragua (FUNICA) project in Nicaragua. Here, we are adapting environmental sensitive area assessment (ESA) to local conditions by incorporating a social component (environmentally and socially sensitive areas, ESSA). More equitable highland-lowland resource (water) allocation (Output 2), and The provision of environmental services: water (Output 3) are the principal foci of our wetlands-water availability research in Colombia partnered with the Corporación Autónoma Regional del Quindío (CRQ), the regional environmental authority. Strengthened organizations: community and institutional capacity building (Output 4) is a major component of our youth in environmental research projects in Honduras, Colombia, and Bolivia, and it is our intent to develop / strengthen this Latin youth network, which is unique in its environmental focus. The efficient use of project resources through participatory project management (Output 5) is highlighted by our strong partnerships (both formal and informal) with local, national, regional, and international partners including community groups, municipalities, regional authorities, national government institutions, universities, and donors.

1.1 Communities and Watersheds Overview

Communities and Watersheds

CIAT
Centro Internacional de Agricultura Tropical
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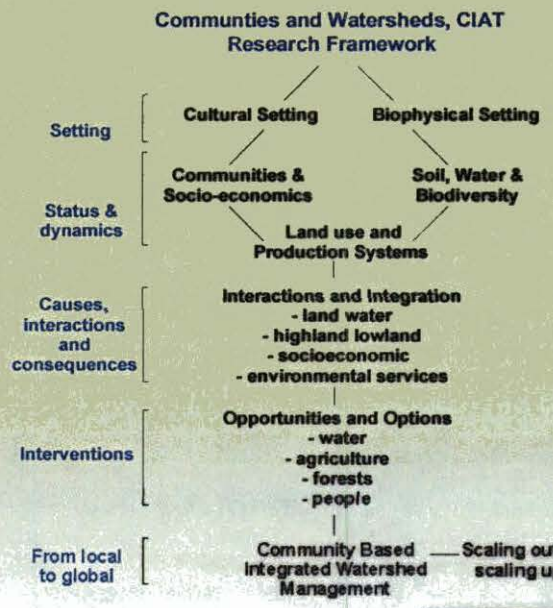
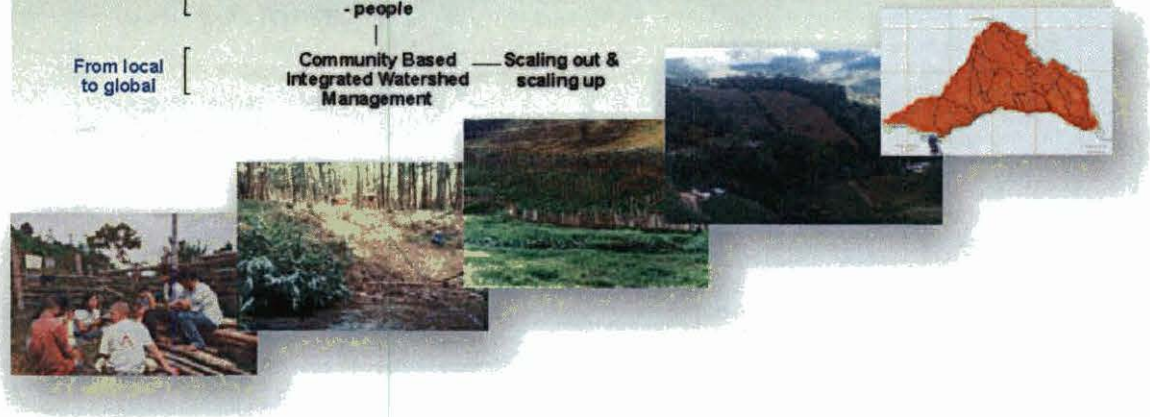
Our Goal:

To improve water, food and environmental quality and through research on land-water-community



Research Framework:

- Environmentally Sensitive Area analysis for hotspot identification
- Contributing area analysis linking water quality to land use
- Mass balances (water, nutrient) to determine shortages and imbalances
- Minimum indicator set for monitoring impact and comparison between watersheds
- Integrated research framework for data synthesis and communication



Research for Development

Data:

- Water use
- Water quality
- Water quantity
- Land-water interactions

Primary data collection of baseline information is often lacking in rural hillside communities, and is fundamental to sound management.

Water is an indicator of ecosystem health, and understanding the impact of management is essential to developing viable solutions

Impact:

- Water use efficiency
- Contaminant removal
- Demand control
- Highland-lowland interactions

It is essential to monitor the effectiveness of best management practices

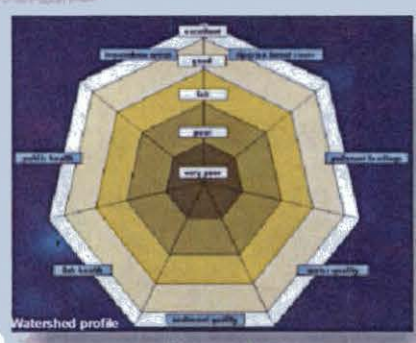
Rooftop water harvesting, drip irrigation, constructed wetlands have local impact, but do they make a difference at the watershed scale?

Community:

- Youth and environmental research
- Community co-researchers
- Environmental education

Youth co-researchers build capacity, leadership, links to the community, an environmental ethic, education, and future research partners.

Common indicators (biophysical and socio-economic) are used to monitor change over time, and compare between watersheds



Products:

- Common indicators
- Watershed profiles
- Comparative watershed studies

Contact us:

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1.2 Mid-Term Plan 2005-2007

Goal: To improve water, food, and environmental quality and services through research on land-water-community interactions.

Outputs:

1. Improved watershed management: land-water interactions
2. More equitable highland-lowland resource (water) allocation
3. Provision of environmental services: water
4. Strengthened organizations: community and institutional capacity building
5. Efficient use of project resources through participatory project management

Gains: Farmers and local organizations adopt technologies, tools, and methods developed by C&W and its partners within research watersheds. Results are sustainable, land use improved, and natural resources conserved at the watershed level. Partner organizations apply technologies, tools and methods developed in conjunction with C&W for their planning and activities at local and regional levels. Decision makers at municipal and regional levels have information, tools, and methods provided by C&W to support their planning, monitoring, and decisions.

Users:

Primary clients:	local governments, local organizations, farmer groups, water user associations
Secondary clients:	research institutions, national governments, nongovernmental organizations (NGOs)
Final beneficiaries:	farmers and communities

Principal Collaborators[1]**:**

CGIAR: IWMI, Water and Food CP

Universities: CATIE (Costa Rica), UBC (Canada), National Agaria (Nicaragua)

NGO: CGIAB (Bolivia), Randi Randi (Ecuador), ASOBOLO, CIPAV, ACTUAR (Colombia), Clodest (Honduras), FIPAH (Honduras), CARE (Nicaragua)

GO: CRQ, CVC (Colombia), INTA (Nicaragua), Municipalities of El Dovio (Colombia) and San Dionisio (Nicaragua), RENOC (Nicaragua)

Local associations: ACERG, Herederos del Planeta (El Dovio, Colombia), Asociacion Campos Verdes (San Dionisio, Nicaragua)

Regional associations: CONDESAN

CIAT: Soils (PE-2), Land Use (PE-4), Forages (IP-5), IPRA (SN-3), Beans (IP-1), Information Systems Unit (IS)

[1] For acronyms and abbreviations used, see list at end of report.

Milestones: 2005 (For acronyms and abbreviations used, see list at end of report.)

Pilot watersheds	Monitoring networks / baseline surveys	▪ A minimum of 2 water monitoring networks established within C&W watersheds by 2005 ▪ Links to a minimum of 2 regional / national monitoring networks by 2005 for data interchange ▪ A minimum of 2 baseline household-level water and resource use surveys designed, implemented within C&W watersheds, and analyzed by the end of 2005
	Integrated watershed management	▪ Image analysis of land use and management (high resolution imagery and ground truthing) completed within 2 C&W watersheds in 2005 ▪ Water availability / wetlands hydrologic response research established in 1 C&W watershed ▪ Riparian use and management studies initiated in 2 C&W watersheds in 2005 ▪ Water Efficient technologies installed and monitored in a minimum of 2 C&W watersheds ▪ Best Management Practices (BMP) assessment in a minimum of 2 C&W watersheds
Workshops / trainings (formal)	Watershed Management	▪ 1 ESA workshop completed by 2005 to support joint CIAT / GO hotspot analysis
	Youth research / leadership	▪ A minimum 2 youth leadership workshops conducted in 2005 ▪ At least 1 joint UBC youth workshop conducted in 2005
	Students / interns	▪ 2 MSc theses to be completed in 2005 ▪ A minimum of 1 ongoing student research activity supported in 2005 ▪ A minimum of 1 internship project completed in 2005
Publications / communication	IT	▪ Website re-design and update completed in 2005 ▪ 1 CD-ROM highlighting project initiatives completed in 2005 ▪ 1 ESA method CD-ROM completed by 2005
	Guides / brochures	▪ A minimum 2 Guides produced on youth research for use by schools and communities by the end of 2005
	Articles, books, conferences	▪ A minimum of 2 scientific papers written and/or presented
Fund raising	Special projects	▪ A minimum of 3 special project proposals written and submitted ▪ Specific donor targets: Kellogg for Colombia and CIDA for Honduras and Nicaragua

Continued.

2006

Pilot watersheds	Monitoring networks / baseline surveys	▪ Continuation of water quantity and quality monitoring within 2 C&W watersheds ▪ Expansion of monitoring sites within 1 C&W watershed ▪ Baseline surveys designed, implemented, and analyzed in 1 additional C&W watershed (based on successful fund raising)
	Integrated watershed management	▪ Image analysis of land use / management completed in 2006 for 1 additional watershed ▪ Continuation of water availability / hydrologic response research initiated in 2004/05 ▪ Assessment of water efficient technologies monitored in 2005 in 2 C&W watersheds
Workshops / trainings	Youth research	▪ A minimum 1 youth research workshop conducted in 2006 ▪ At least 1 joint UBC workshop conducted in 2006
	Students / interns	▪ A minimum of 1 student with research activities ongoing in 2006 ▪ A minimum 1 intern per South and Central America
Publications / communication	IT	▪ Translation of 1 UBC CD-ROM text into Spanish completed in 2006 ▪ Application of ESA CD translated in 2005
	Guides / brochures	▪ Application of Guides produced in 2005 on youth research within 2 C&W watersheds
	Articles, books, conferences	▪ A minimum of 2 scientific papers written and/or presented in 2006
Fund raising	Special projects	▪ A minimum of 2 special project proposals written and submitted in 2006

Continued.

2007

Pilot watersheds	Monitoring networks / baseline surveys	▪ Continuation of water quantity and quality monitoring within 3 C&W watersheds ▪ Expansion of monitoring sites within 2 partner watersheds in South America (based on successful fund raising) ▪ Baseline surveys designed, implemented, and analyzed in 2 partner watersheds in South America (based on successful fund raising)
	Integrated watershed management	▪ Water balance / availability assessment completed in 2007 for 1 C&W watershed ▪ Environmentally Sensitive Area Assessment pilot project initiated to adapt the UBC methodology to Latin America (based on successful fund raising)
Workshops / trainings	Youth research	▪ At least 1 joint UBC workshop conducted in 2007
	Students / interns	▪ 1 UBC PhD student thesis completed in 2007 ▪ A minimum 1 intern per South and Central America
Publications / communication	IT	▪ Website and CD-ROM developed in 2007 highlighting research results in 1 C&W watershed
	Articles, books, conferences	▪ A minimum of 2 scientific papers written and/or presented in 2007
Fund raising	Special projects	▪ A minimum of 2 special project proposals written and submitted in 2007

CIAT C&W Project LogFrame (2005-2007)

Project: **Communities and Watersheds**
Manager: José Ignacio Sanz

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal: To improve water, food, and environmental quality and services through research on land-water-community interactions.	Water quantity and quality parameters Water efficiency (use and technologies) Farmer adoption of technologies / methods	Local research / monitoring networks Comparable indicators Watershed comparisons	The environmental, social, economic, and political conditions are maintained on a macro level.
Purpose: To strengthen local processes of watershed management and sustainable agricultural development in tropical regions based on the experiences of NRM at research watersheds.	Local capacity building – training programs Youth involvement in NRM Community-based involvement in watershed management	No. workshops conducted No. youth groups / projects Level of community participation in watershed management activities	Local partners continue project-related activities. Donors interested in the proposed project objectives and provide support.
Output 1 Improved watershed management based on knowledge of land-water interactions.	Land-water interactions: Water quantity and quality parameters Land use: management and change	Field research Monitoring networks Primary data collection Image analysis and field verification	Climate variability is normal. Donor support is obtained. Social stability
Output 2 More equitable highland-lowland resource (water) allocation.	Highland-lowland interactions: Water quality parameters Water quantity (drinking and irrigation) Water use (by sector)	Field research Monitoring networks Primary data collection Water use survey	Climate variability is normal. Donor support is obtained. Social stability

Continued.

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Output 3 Provision of environmental services: water	Water: *Water quality parameters* Water quantity parameters Water use by sector Riparian buffers (type and quality)	Field research Monitoring networks Primary data collection Water use survey Riparian buffer inventory	Climate variability is normal. Donor support is obtained. Social stability
Output 4 Strengthened organizations: community and institutional capacity building	Training programs Youth group formation and activities Information dissemination (format and content) Partnerships	No. and type of workshops conducted No. youth groups / projects No. reports, CDs, Website links, papers, presentations No. and type of partners (GO, NGO, local, regional)	*Donor support obtained.* Social stability.
Output 5 Efficient use of project resources through participatory project management	Approved projects designed with partners and donors Partners participate in fieldwork Data sharing agreements Lessons learned by the project and its partners disseminated New projects adopt methods, techniques, and experiences generated by the project and its partners Alliances – strategic and special project	No. new projects funded No. and type partners and level of participation No. data sharing agreements No. papers, brochures, Website links, CD-ROMS, documentation of replication of methods and techniques No. and type of partners (GO, NGO, local, regional)	Institutional linkages are maintained. Donor support is obtained.

2. Pilot Watersheds

2.1 Youth in Natural Resource Management, El Dovio, Colombia

The overall goal of our "Youth and Natural Resource Management" Project in Colombia is to actively involve youth in a program of research on water and natural resource management that facilitates personal development, promotes environmental stewardship, and provides opportunities for environmental education. We are focusing on four principal themes: leadership, youth lead research projects, sustainability, and a model for replication. A range of activities is conducted under each theme at various scales, from the Garrapatas River Canyon to the Los Sainos Microwatershed, and with a range of partners, including the Asociación de Centros Educativos del Cañon del Río Garrapatas (ACERG), the association of local schools, the Environmental Office of the Municipality of El Dovio, ACTUAR - a local NGO, and Heirs of the Planet - a local youth group. The project is entering its final year of funding for this phase, and we are proposing the extension of the project into a Latin Youth Network focused on water and natural resources that will link our "youth" projects in Colombia, Honduras, and Bolivia.

2.1.1 Leadership

Introduction

The youth leadership component of the Communities and Watersheds (C&W) research projects has several purposes: first, it is thought of as the basis of research projects aimed at solving problems that are felt by local communities and perceived by youth as posing a threat to their future. By developing youth leadership skills, young leaders become co-researchers, critics, and the link between rural communities and researchers. In this way, youth leadership serves as the initiation of long-lasting relationships between the scientific and the rural communities. Second, youth leadership potentialises the impact and speed of assimilation of new knowledge in natural resource management. Youth involvement in research projects related to resources that offer them a source of income or employment, now or in the future, ensures immediate use of research findings and the willingness of parents to support and encourage research activities in their watersheds. Leadership development gives adolescents a voice in the decision-making processes that affect their lives.

Human development

We define leaders as individuals who think for themselves, have the ability to use personal strengths, communicate their thoughts and feelings to others, influence and motivate others to follow a common cause, work collectively to achieve results, and have a high standard of achievement. Leadership is therefore a set of skills and attitudes that can be learnt and developed. After 3½ years of working with youth in research projects in Honduras and Colombia, we have designed a leadership program for youth under the premise that everyone has the potential to lead, and that the skills critical for effective leadership, including the capacity to understand and interact with others, develop strikingly in adolescence and especially in young adulthood. This program takes into consideration both transactional and transformational leadership and the three steps of leadership development: awareness, interaction, and mastery. In

every step of leadership development, individuals have a different perception about leadership, a different attitude towards leadership, varying degrees of self-knowledge, communications skills, decision-making skills, abilities to work in teams, and conflict management skills. The program includes three workshops that target individuals in the three different stages of leadership development.

Results of these workshops show up in the short term in the performance of youth in activities in their schools, families, communities, and research activities. However, it is likely that the biggest effect of the skills developed in these workshops, if practised and assimilated by participants, will have a longer term effect in that these individuals will have the skills and abilities to develop their potential fully.

Objective leadership – Community Youth Magazine

The Youth Magazine (Figure 1) is an unexpected product of the process of identification of young leaders in the zone. It resulted from the need to create and facilitate communication amongst young people and the institutions participating in the project. Table 1 gives a summary of the achievements of the first three editions

Figure 1. Reading the Youth Magazine.

Table 1. Community Youth Magazine edition activities and results.

Phase[a]	Edition activities and results		
	1st edition		
	No. of youth members	Activities	Results
1. Develop channels of communication that permit real integration among the youth of Bellavista and those of other villages involved both in ACERG and the Youth Project, and at the level of institutions	17	-Get together in which two workgroups were formed: one in La Hondura in the Juan Salvador Gaviota College, and the other in Dovio with the José Maria Falta College -The magazine was not named, the aim being to establish communication with the community by having a naming competition. -Meetings each week to coordinate the contents of the articles written by young people -Printing of 1000 copies of the issue for sale	-Leadership abilities were identified among youth that permitted their carrying out interviews, visits, and research on themes of interest both to the zone and to youth. -It was important to make two work groups - one rural and one urban - to unify and establish a single language for the youth community. -Youth problems were identified in the classrooms, and in access to computers, and knowledge of technology was improved. -Not many sales were generated since the community did not know much about this new medium, and the young people did not take responsibility for the money.

Continued.

Table 1. Continued.

Phase	Edition activities and results		
	2nd edition		
	No. of youth members	Activities	Results
2. Generate expectation of the medium within the urban and rural community with the aim of making known the magazine at all levels and defining its position	15	-Meeting with the Mayor of Dovio to present the communication project for the zone -Printing of 600 copies of the Second Edition of the magazine -Launch of the magazine in the urban sector as an activity of youth story telling, dance, and presentations of musical groups -Placing of boxes in different zones of the municipality, such as colleges and the Mayor's Office, to receive the community's contributions	-The Mayor agreed to contribute some resources (100,000 pesos) to cover the cost of the first issue and produce the second. -All 600 copies were sold both in the rural and urban areas. -A fund was created for the sustainability of the project that started off with 450,000 pesos.
3. Continue to generate information among the youth in the zone	8	-Meetings for a new assembly for the participation of youth in the project -Produce and print the third edition of the magazine -A committee will be formed for fund management.	-Because of the holiday season, most project members had graduated and left the municipality to study or work in other parts. Thus, new youth needed to be assembled to take part in the project. -Production team selects magazine's name thanks to community suggestions: Eureka!

a. ACERG, Asociación de Centros Educativos del Cañon del Río Garrapatas.

2.1.2 Youth-led research projects

Introduction

We view youth as our long-term research partners within the project because they are sensitive and committed to environmental conservation, and because changing behaviors for sustainability is more effectively done through educating the young. Youth co-investigators are actively involved in all stages of research from design, data collection, analysis, and presentation of results to working with local organizations in deciding future actions. Mentoring scientists to youth to children has helped us develop local research capacity, and while processes were initially slower, there has been a long-run payoff in local capacity.

Food security

There are two components to the food security research: (1) bio-intensive vegetable gardens, and (2) basic grains.

Bio-intensive vegetables gardens. Most young people in the Garrapatas Canyon are not below average National Center for Health Statistics (NCHS) standards for height or weight, but there are concerns that many lack physical or economic access to sufficient nutrition. The objectives of the research on vegetable gardens are to: improve food security conditions, improve the quality of food / nutrition for youth and children, save money through the production of "home-grown" vegetables, and improve soil conditions. The first step was designing, conducting and analyzing a survey on food consumption and purchasing patterns with the youth. Fifty surveys were conducted, and the results reveal a lack of diversity in diet, low consumption of fruits and vegetables, and the purchasing of most the regularly consumed foods, many of which could be grown locally. The consumption of fruits and vegetables for example (Figure 2) highlights the low average consumption with the exception of *onion, tomato, lemon* and fresh coriander (used for salsa and lemon drink). The proportion of carbohydrates produced versus purchased (Figure 3) illustrates that many purchased products such as potato, maize, beans, carrots, and cabbage could be grown locally, saving money.

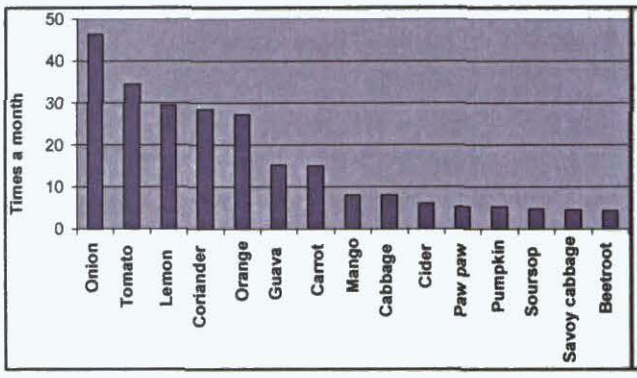

Figure 2. Average monthly consumption of "vitamins".

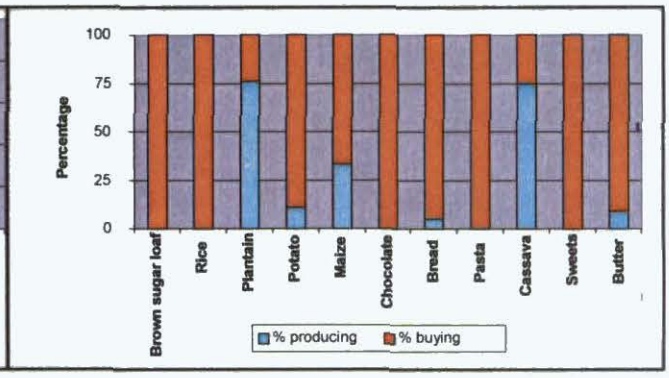

Figure 3. Percentage of producers versus those buying "carbohydrates".

To increase food and nutrition supply, participative evaluation is now in process to carry out the adoption of the technology of bio-intensive gardens. The principles behind these are: double digging, compost, close seeding, and the association of plants to minimize insect infestation.

The aim is to record the advantages of production by the bio-intensive method compared with traditional production (Figure 4), so that the communities take decisions to implement the new technology through their own conviction, and not as something imposed upon them by institutions. Fifteen trials were established, three in each village (Los Zainos, La Peña, Puerto Nuevo, La Hondura, and Guatemala) with 10 food products (carrot, celery, lettuce, fresh coriander, beetroot, cucumber, green bean, cabbage, scallion, and onion). These

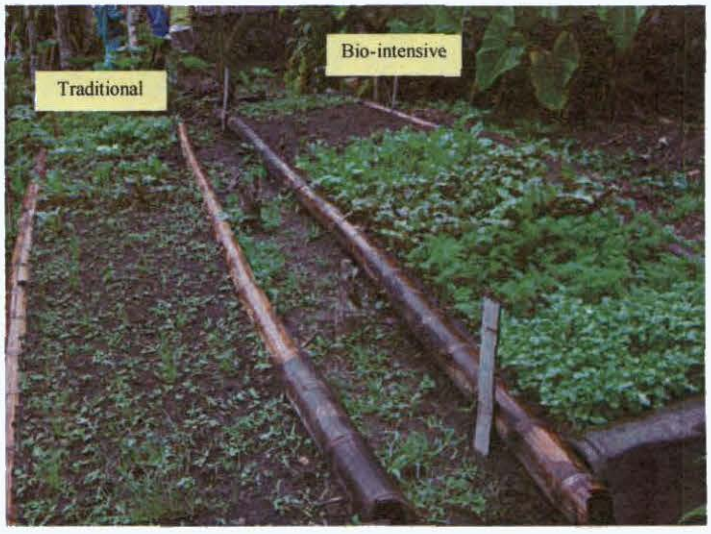

Figure 4. Traditional vs. bio-intensive garden.

were selected by the families in a survey towards the end of 2003, applied to the 22 families who so far have home gardens.

The data now being evaluated from the 15 trials are: edible weight and waste in the two types of garden, plant height on harvest, and length of stem vs. root. Qualitative data are collected also through open questions made to the community members responsible for each of the gardens, so that through their observations they make a comparative analysis on the possible advantages and disadvantages of each of the two systems. At the end of this process, the results obtained will be presented to the community and conclusions given, and hopefully feedback will be received.

The implementation of bio-intensive gardens has spread considerably since July 2003 when the process was begun with the establishment of the gardens after sensitizing and training the educational community on the importance of food security and the alternative of the bio-intensive gardens in achieving this. Preliminary results are presented each trimester and by village. In the third trimester of 2003, 21 gardens were established in three villages (la Peña, Peñones, and Guatemala), establishing the first in schools and the rest on the properties of interested families. It was observed that the gardens established in schools are abandoned in holiday periods and weekends, since the young people are not at school. On the other hand, the gardens established in family units were better managed by the young people and parents.

In the last trimester of 2003 (Oct-Dec) interest was detected in the communities of another four villages (Los Sainos, Bellavista, Puerto Nuevo, and la Hondura), with eight more gardens being implemented. During the first three trimesters of 2004 (Jan-Mar, Apr-Jne, and Jly-Sept) interest has increased in the villages where this alternative has been implemented, and a producer from the urban sector has shown interest. Figure 5 shows the increase in bio-intensive gardens to date.

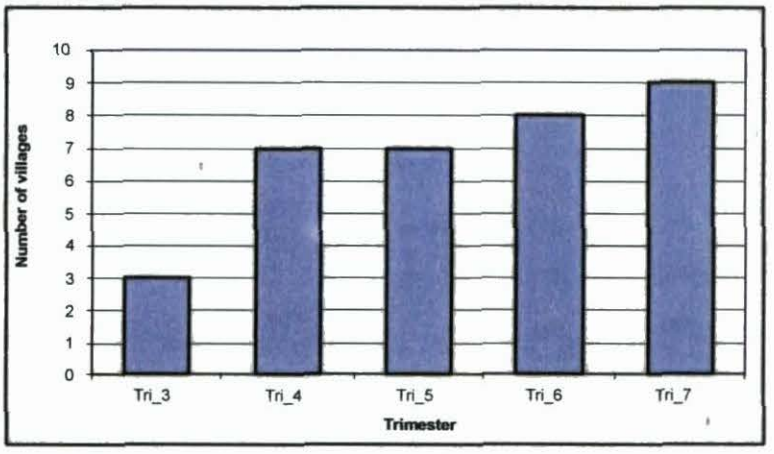

Figure 5. Development of bio-intensive gardens from September 2003 to July-September 2004.

It is noteworthy that the spread of bio-intensive gardens, initially under the leadership of project technicians and the directly linked community, has taken on its own dynamic with families implementing the technology under their own initiative. Since September 2004, nine villages have been linked and 45 bio-intensive gardens directly established by the project (Figure 6).

In comparing the response to the implementation of bio-intensive gardens by village, it was observed that Puerto Nuevo and La Peña have most adopted the gardens (Figure 7), possibly because they are more distant from the urban sector of El Dovio, and so have poor access to centers of commercialization (Figure 8). For this reason, they respond positively to this type of technological initiative to produce their own food.

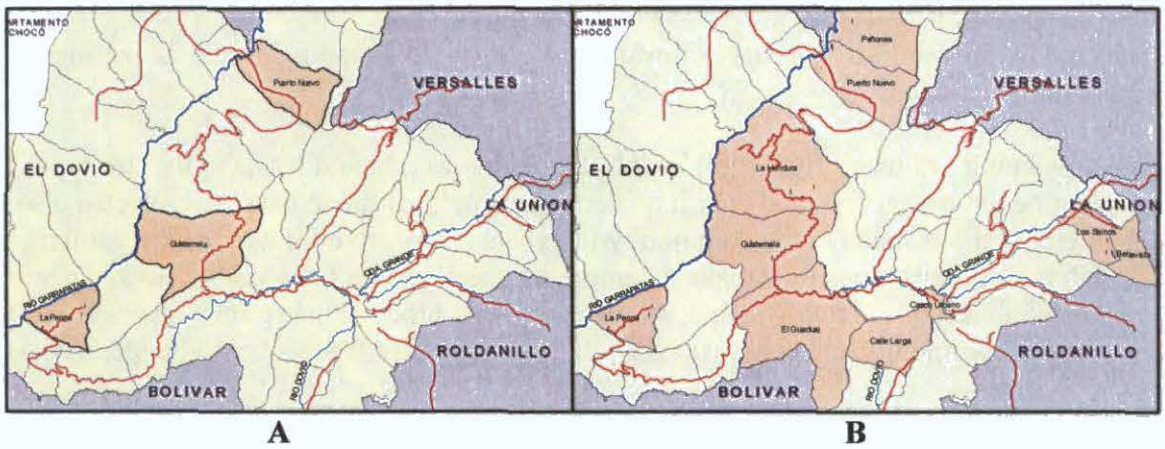

Figure 6. Spread of the adoption of bio-intensive gardens (darker yellow coloring) between (A) July-September 2003 and (B) July-September 2004.

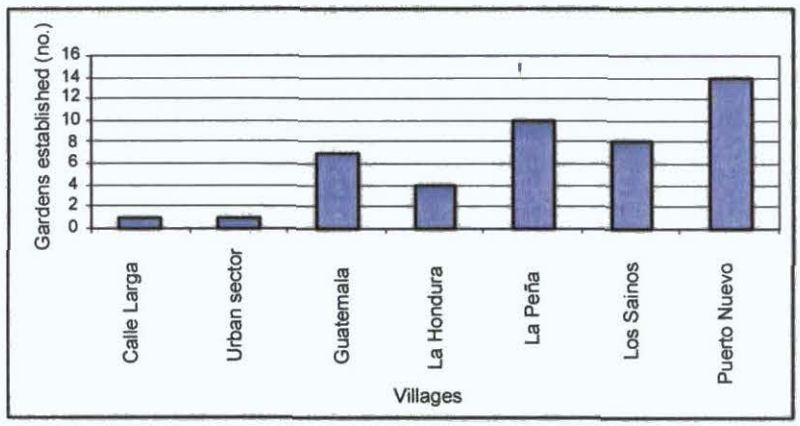

Figure 7. Number of bio-intensive gardens implemented in each of the villages from the upper to middle watershed of the Garrapatas River.

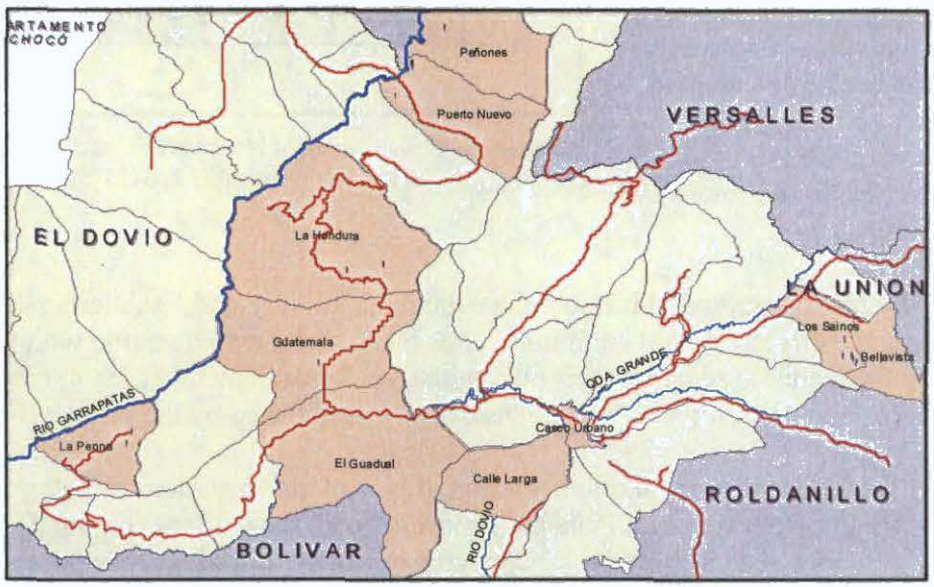

Figure 8. Access of villages of the project area of influence to the urban sector (Casco Urbano) of El Dovio.

Basic grains. The main diet components in the region are rice, beans, and maize. The youth were interested in how we could improve food security with respect to these basic diet components. The objectives of the research on basic grains are to: select varieties of basic grains that are adapted to the humid conditions of the zone, develop a local seed source for these varieties, and investigate new species such as soya. Field trials on the adaptation of different varieties are ongoing, and the group plans to visit a Comité de Investigación Agrícola Local (CIAL) producing soya in Cauca to learn from its experiences.

Watershed research, Los Sainos Microwatershed

Insufficient water in the dry season, poor water quality for domestic use, and poor management of natural resources in the lower part of the watershed are issues of concern raised by youth in the Los Sainos Watershed. The research questions being addressed by the local youth are: Can wetlands be restored in the upper watershed to improve the quantity and/or quality of water? What are the sources of water contamination? And, what are the possibilities of improving practices of natural resource management? The first step in the watershed research was to conduct a survey on the use of water and natural resources. Local youth were active in the survey design, conducted the survey in teams supported by CIAT scientists, interpreted the survey results in a participatory manner, and presented results back to the community for discussion and future action. Fifty-four surveys were conducted, interviewing all households in the upper and lower watershed. Water shortages are prevalent from June to August, and again in January and February. Ninety percent of residents boil their water for domestic use, and 27% allow their animals direct access to the streams.

As a result of the youth presentation of the survey results, the upper and lower communities of the Los Sainos Microwatershed decided to work together to help improve the sedimentation problem at their water source. A small fund donated by the Mark Creek Restoration youth in Kimberly, British Columbia, Canada was used to initiate stream bank stabilization work, and bio-remediation using native tree and grass species to stabilize the banks will be undertaken in the upcoming year.

The youth team, with the aid of CIAT scientists have begun monitoring precipitation, wetland water levels, and downstream flow to calculate water balance and attempt to determine the impact of the ecological restoration of small isolated wetlands on downstream water availability.

Livestock

To identify and incorporate sustainable production, the process will be tackled through four complementary phases: socialization and sensibilization, training, research and analysis, and diffusion of results. In the first year of the project, the sensibilization and socialization of the distinct components of the integrated agricultural production systems was carried out with different groups in the community of the middle watershed zone of the Garrapatas River, with special emphasis on the young student community in this zone.

This year, the process continued through training in Sistemas Integrados de Producción Pecuaria (SIPP). Different technologies were presented to optimize the use of local resources in livestock production and the sustainable use of local natural resources. Training in constructions made for livestock was undertaken, and in different alternatives in livestock production: birds, fish, and pigs. The phase of recording and investigation has begun through protocols of participative research, to identify the factors that guarantee sustainability of the SIPP (Figure 9).

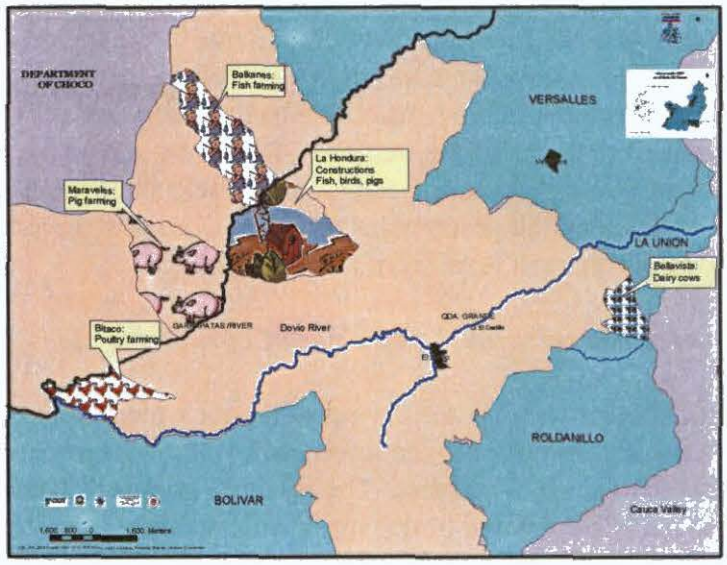

Figure 9. Location of livestock production systems, municipality of El Dovio, Colombia.

Methodology. The process is underway in five of the 45 villages of the municipality of El Dovio, middle watershed of the Garrapatas River: Bitaco, Balkanes, Maraveles, La Hondura, and Bellavista. Activities use simple methodologies appropriate to the profile of the beneficiary population (children and youth between 6 and 23 years of age), using directed games and learning-by-doing methods. To carry out this proposal, different activities or training strategies were carried out: theoretical and practical training workshops; interchanges or visits to similar experiences; dialogue of knowledge between beneficiaries and the technical team; and development of participative research trials.

To reach the goal of realizing a process of participative research that contributes to the integral formation of children and youth, a process of training in production and livestock systems, management of local natural resources, and sustainable development was carried out, supported in the four strategies (Table 2).

Table 2. Activities developed in the training phase (year 2).

Activities[a]	Date	Place/Village	Attendance
Leadership Workshop for forming and managing projects	29 Apr-4 May 2003	Villages, SIPP group	73
Introductory Workshop for SIPP	5 Oct 2003	Villages, SIPP group	47
Workshop on nutrition and practical establishment of forages	9 Oct 2003	Villages, SIPP group	60
Visit to El Ciprés Natural Reservation	21-22 Nov 2003	Bellavista village	25
Resocialization of SIPP proposal	10-12 March 2004	Villages, SIPP group	18
Workshop of constructions for fish farming	18-19 Mar 2004	La Hondura	23
Workshop of co-researchers and participative elaboration of protocols	30 Jne 2004	La Hondura	37
Workshop on zoonotic diseases and practices of sanitation management	6 Jly 2004	La Hondura	26

a. SIPP, Sistemas Integrados de Producción Pecuaria.

Participative research. With results from the sensibilization and training, the definition of the study species, and the creation of a conceptual framework centered on the research trials, the following research question was defined for the teachers and co-investigators to answer: Can local forage resources somehow contribute biologically and economically to the livestock systems (minor species) in the agro-ecological and sociocultural context of the Garrapatas River Canyon?

Hopefully, the answer will be obtained by carrying out three biological tests that permit investigators to develop their observation and recording of quantifiable and understandable answers and to reach specific technical information that improves production possibilities in the study zone. In summary, the biological tests consist of testing the response of the animal species (birds, fish, and pigs) to diets with the addition of either commercial concentrate, or bushy and herbaceous forages (*Trichanthera gigantea* Nees, *Alocasia macrorrhizos* [L.] G. Don, *Boehmeria nivea* [L.] Gaudich, and *Morus* spp.), or energy-giving foods (plantain, *aracacha* [*Arracacia xanthorrhiza* Bancr.], and sugar cane) as fresh base. The additive and the dosis vary according to the animal species to which it is given.

Data are collected, in each research group, by the local co-investigators with the support of the local youth leader (Edwin Caro) and the teachers of the different schools. Variables were recorded such as:

- Daily supply of forages and other foods in fresh weight (kg);
- Rejection of forages and other foods in fresh weight (kg);
- Weekly production of manure per group of animals (kg);
- Daily weight gain calculated from weightings every 7 days;
- Difference in growth (height in cm), mortality (number and %);
- Start, peak, and average egg laying;
- Efficiency in cleaning the lots of the crop in time;
- Specific environmental conditions; and
- Economic evaluation of production parameters.

Data are recorded using a field diary proposed by the technicians and adjusted to the understanding of the young co-investigators.

Three forage species have been sown in 1100 m^2, and constructions have been made on 1540 m^2 using alternative technologies and local resources.

Ecology

The participative research in natural resources is being conducted with an emphasis on arboreal and bushy flora having potential for ecological restoration with two main groups (youth and children). Two contexts are being used: first, the recognition of flora by participants; and second, the recognition and systematization of relevant data to determine the variability of species for ecological restoration processes through a thesis in ecology.

The principal methodologies being used include characterizing arboreal and bushy vegetation, collecting and identifying vegetative material, elaborating vegetation profiles, identifying the community's uses and perceptions of the trees, and identifying potential species for ecological restoration. It is noteworthy that both aspects, research and flora recognition, fit into one another and are complementary in that there is feedback made through a pedagogic process in which all learn.

Public order disturbances have necessitated changes in the planned timetable for establishing nurseries and herbaria, which now will be carried out in the third year of the project.

In the tree research in Los Sainos and Bellavista, eight sensibilization events have been held with youth from these villages including: trees, soil and water – inseparable friends; inventory of the trees of the area; and building herbaria in schools.

There are four support processes for young investigators in: conservation of seed of *arboloco* (*Montanoa quadrangularis* Sch. Bip.), production of its pith, phenology and regeneration of the *chagualo* (Clusiaceae family), and training in data processing.

Children's research projects on phenology and regeneration of trees, and on propagation of native trees are in early stages. These processes, programmed for this year, have suffered operative setbacks because of the zone's difficult access. However, we hope to invigorate activities in the second semester of 2004.

A thesis, "Characterization of the arboreal and bushy flora of Los Sainos and Bellavista areas", is underway.

In the two areas, 2210 individual flora distributed in 41 families, 108 genera, and 157 species were recorded. Bellavista had the largest number of families, genera, and species. However, the difference between the two areas was small. Lauraceae is the family with the greatest number of species here, followed by Moraceae, Leguminosae-Mimosoideae, and Rubiaceae. For each part sampled, a sketch was made of the vegetation profile to describe the different components of each wood.

Workshops and visits permitted learning the uses, perceptions, and preferences of the two communities regarding trees and bushes in the area. Workshop participants recognize the trees that are near their homes, in the crop and in their paddocks. However, they know the trees of the woods less because they go there infrequently for different reasons, such as collecting firewood or wood for making furniture.

In general, men know more about the flora of the woods, recognize plants, know their common names, and can identify their uses. Women mainly identify plants used for firewood since they are responsible for its collection. Young people and children do not recognize most of the plants.

Workshop participants gave their views of the characteristics that a tree should have for reforestation are: rapid growth, leaf growth, shade, and production of wood.

The project used as characteristics for a species to be suitable for ecological restoration: (1) symbiosis with nitrogen-fixing organism or mycorrhiza, (2) rapid growth, (3) abundant regeneration, (4) adaptability to compacted soils, (5) rapidly decomposing dead leaves, (6) medium shade, (7) stems and roots capable of shooting, (8) high fruit production, (9) high seed production, (10) production of food for fauna in the woods, (11) water retention, (12) aesthetic value (attractive or striking trees), (13) deep root system, (14) leafiness, (15) high-quality timber, (16) firewood and wood for construction, (17) colonization of gullies, (18) protection of watersheds, and (19) endangered species.

2.1.3 Sustainability

Production, transformation, and commercialization of bamboo

The rural community of El Dovio chose bamboo as an abundant and not yet exploited resource in the zone. A research process was begun in order to offer the community training that would permit using this resource and generating sustainable employment and income. To begin the process, new partners such as the Unidad Municipal de Asistencia Técnica Agropecuária (UMATA) and the Mayor's Office of El Dovio joined the project. They agreed to continue assembling youth to participate in the project, and supported the process with resources for the trainers, such as transport, food, and lodging. Also, ACTUAR FAMIEMPRESAS of Quindío was chosen as the institution responsible for all training in the management, transformation, and commercialization of bamboo. This organization presented a proposal in tune with the project's aims, dividing the process into three parts. The first phase was to educate youth in business and in money management (45 participants). The second phase (45 participants) gave technical training in the transformation of bamboo, and included a visit to the bamboo center at Córdoba in Quindío. The third phase (25 participants) dealt with the commercialization of the transformed products. The photos below show youth at work and results of their work on bamboo, the transformed products.

Bamboo – environmental impacts

A process of sensibilization of the community, and especially of youth, has been begun on the role of bamboo in the environmental supply of the watershed. The process began with an inventory of the areas with ecosystems associated to bamboo, and the location of potential areas

for its propagation. The aim is to begin a phase of monitoring and determining of types of bamboo and their ecosystems, associated to generating environmental goods and services, with special emphasis on the water resource. Towards this end, we continue to work in alliance with the local and regional institutions related to the sector: the municipal Mayor's Office of El Dovio, ACTUAR FAMIEMPRESAS of Quindío, the group of artisans of La Guadua, Los Herederos del Planeta, and we have begun approaches to the Corporación autónoma regional del Valle del Cauca (CVC), which is responsible for territorial environmental management.

The process of inventory and characterization of bamboo and its supply has been planned in participative manner. Finding out the actual state of the resource and its evolution also serves as a further element in educating the youth of the watershed. The process has been sustained through geographic information systems (GIS) with geo-referencing by global positioning system (GPS), the interpretation of remote sensing imagery, and geographic analysis made in the work zone's GIS station so that the process of data capture, systematization, edition, and analysis is entirely in the hands of local actors in coordination with project technicians.

Seed capital fund

The Kellogg Foundation in the framework of the Youth Project and within one of its objectives targets the improvement of access to education for the young and the strengthening of organizational groups. For this reason, a sum was assigned to create the Seed Capital Fund in the municipality of El Dovio. The main object is to achieve the integral development of youth in this municipality, so that they generate and invigorate profitable and environmentally sustainable production processes, through two mechanisms:

- Help youth have access to processes of investigation, and
- Integrate youth in the production chains of different crops and the assessment of natural resources and their abundant use in the zone.

This process began in January 2004 when the Corporación para el Desarrollo del Municipio de Versalles (CORPOVERSALLES), which is non profit and works for the development of the municipality of Versalles, passed a consultancy proposal for the youth of Garrapatas Canyon. Analysis led us to dismiss this proposal because we would incur high administrative costs and the interest on loans was far higher than bank rates.

The decision was taken to seek funding for the process with the municipal Mayor's Office of El Dovio, which is highly interested in supporting the financing of initiatives in the education and training of the population of the municipality. We await authorization from the accountants to start the process of the outlay of funds.

2.1.4 Model for replication

Connectivity

The connectivity project in El Dovio is a process that permits repeating the youth project in other zones and with other work groups in the municipality, digitally systematizing the processes of the research projects that the youth develop, converting them into a virtual learning.

With the Mayor's Office of El Dovio, investigation was begun for creating a virtual Community Center of Advanced Education with the establishment of a computer room with Internet connection. With this aim, we responded to the call made by the Ministerio de Educación Nacional (MEN) to co-finance this type of process. To strengthen this proposal, a Regional Alliance was created between various institutions such as the Servicio Nacional de Aprendizaje (SENA), Instituto Técnico Profesionales (INTEP) of Roldanillo, CIAT, the Mayors Offices of El Dovio and Versalles, and associated groups of the zone that represent the production sector. Together they generated the proposal that will permit creating a center that will offer the youth community the possibility of continuing their training and studies. The Information Systems (IS) unit of CIAT joined this effort, committing themselves in the technological research with contacts and management of the COMPARTEL network, and the provision of up-to-date computers that support programs for managing virtual courses. It is hoped that the Regional Alliance will develop this process and have it established in the following work year.

2.1.5 Lessons learned

Working with youth helps our scientific team focus on real world issues relevant for rural communities, develop an environmental ethic at the local level, and concentrate on applied research. Working in a conflict area has been possible through maintaining a neutral presence, working with local research assistants, and the perception that youth are non-confrontational. Our mentoring systems, scientists to youth to children, has built local research capacity, and bridged to other institutions interested in supporting youth initiatives. Youth demand more than research. They are interested in leadership training, income generation activities, and environmental education. By combining activities, we have been able to offer unique opportunities to the youth of the communities of the Garrapatas River, and we feel that the local youth are rapidly becoming a valuable environmental resource.

2.2 Wetlands and Water Allocation, Barbas River, Colombia

2.2.1 Water towers

To better understand water resource availability and allocation within Colombia, a case study is being undertaken in the upper Barbas River watershed, located within the nationally prioritized La Vieja River pilot catchment. The upper Barbas watershed, in the municipality of Filandia, serves as a "water tower" for downstream users within both CRQ and CVC regional districts. The upper Barbas has a mean annual precipitation of 2800 mm, significantly higher than the surrounding region, and wetlands in the upper microwatersheds are believed to play an important role in regulating stream flow, and in supplying base flow during the dry season. More than half the population of the watershed is rural, and unemployment rates are the highest in the country. Cattle ranching, coffee, flowers, fruits, and vegetables are the main economic activities, with

cattle ranching dominating in the upper watershed. Cattle ranching is believed to account for the high levels of fecal coliforms (>2,000 counts / 100 mL) measured at the water intakes, but contaminants have not been monitored upstream. Twenty-nine water intakes (*bocatomas*) supply potable water for eight downstream municipalities, but there is only partial knowledge of water flow in these tributaries, and an unknown number of beneficiaries. The demand for water is high; three tributaries run dry before reaching the Barbas River in the dry season, and a number of concessions are above dry season flow levels. Despite efforts by CRQ (regional authority) at wetland restoration, encroachment by extensive cattle ranching threatens upland water sources, and the local communities have yet to be involved in the discussion on water source protection, use, and allocation. The Barbas River catchment of about 10,000 ha, together with another four catchments of similar size also belonging to La Vieja River catchment, has been prioritized for the development of a watershed management plan that can be used as a model in the future in other parts of the country.

2.2.2 Wetland and green water research initiative

A research project integrating wetland processes into watershed management has been initiated in the upper Barbas River watershed to evaluate the role of Andean wetlands in small catchment hydrology. This research is being led by a CIAT PhD student enrolled at the University of British Columbia, Canada as part of the CIAT-UBC alliance. Two Masters students (Centro Agronómico Tropical de Investigación y Enseñanza [CATIE] and the University of Wageningen) also are involved, along with local co-researchers. The research focuses on three principal questions: How do wetlands contribute to the capacity of small catchments to hold water (green water contribution)? How do wetlands contribute to water flow regulation temporally in the streams? And, what are the management implications of wetland conservation / restoration? The research design includes the construction of water balances for wetland and small watershed scales, and the use and management of water downstream to compare allocation and availability. Climate, stream flow, and wetland monitoring equipment have been installed, including pan evaporation, automated rain gauges, dip wells, and pressure transducers to monitor stream stage, and a wetland inventory is ongoing (Figures 10 and 11).

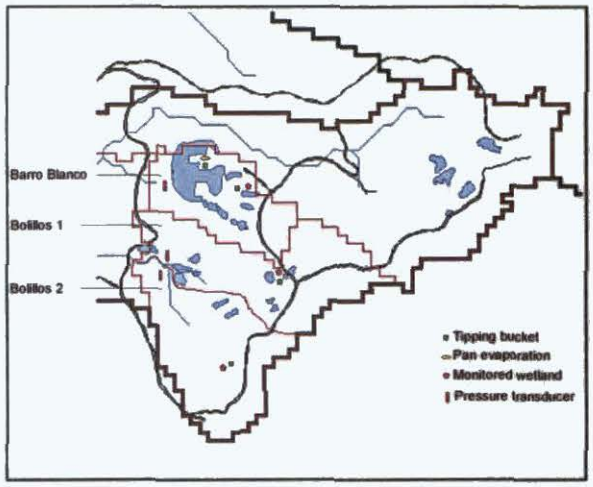

Figure 10. Wetland monitoring equipment in the upper Barbas River watershed.

Figure 11. Working on the wetland inventory

2.3 Tascalapa Watershed, Honduras

- Base line structured from the minimum set of indicators for watershed analysis developed by C&W and linked to the research framework. This base line continues in process through the taking of quantifiable data.
- Groups of young researchers strengthened and with research results in the management of watersheds and production systems for food security.

2.3.1 Base line

From the minimum set of indicators for watershed analysis developed by C&W and linked to the research framework, we have identified basic indicators for quantifying and analyzing the biophysical and socioeconomic interactions in the Tascalapa River subwatershed (Figure 12).

Figure 12. Site of the Tascalapa River subwatershed.

The population is concentrated in the lower zone of the subwatershed where access and land availability are better and there is more fertile soil for agricultural production. The upper zone has a mostly indigenous population and represents 19% of the total. The indigenous groups mainly devote themselves to the production of basic grains (maize, beans) and coffee.

The ethnic groups are the Tolupan or Xicaques and are located in the small villages of Mina Honda and Luquigue in Yorito. More than 1464 indigenous people live in Capiro, El Pacayal, La Patastera, Los Jimeritos, Mina Honda, El Plan, El Pichingo, Lagunita Las Brisas, Los Achiotes, and Pinabetal (Figure 13).

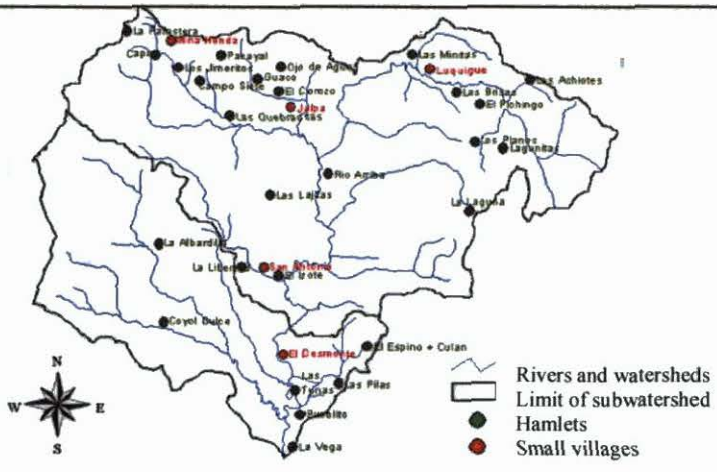

Figure 13. Location of ethnic groups in the Tascalapa River subwatershed.

Houses are generally 20 m^2 in size and occupied on the average by five persons, which shows a high level of crowding.

The population of the Tascalapa subwatershed shows big deficiencies in basic services: (a) 65% have no electricity; only those in the lower zone have electricity, basically for lighting, and a few families use it for preparing food or other use; (b) 36% have no latrines and of those who do, about 80% of families do not use this service adequately, since many are abandoned and others are not hygienically managed, occasioning problems of water source contamination; and (c) 16%

(of which 62% is the indigenous population) have no potable water service, occasioning health problems (Figure 14).

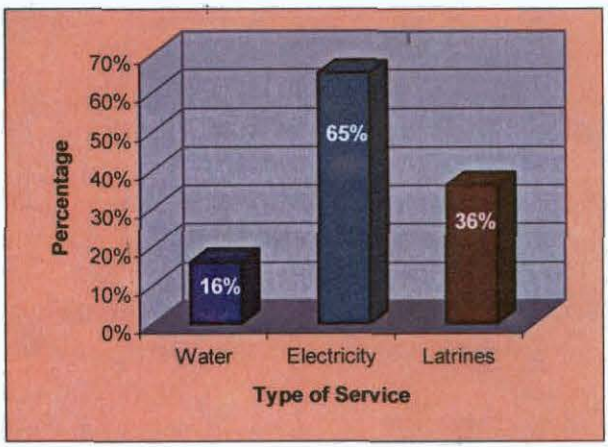

Figure 14. Availability of basic services in the Tascalapa subwatershed.

The region has two Health Centers, one in Luquigue (Yorito) and one in San Antonio (Sulaco). The nearest hospital is in the departmental head of Yoro, some 40 km away. The most frequent illnesses are respiratory (common cold, bronchitis, bronchial asthma, and pneumonia), accounting for 54%; gastrointestinal and infectious (intestinal parasites, diarrhea, skin infections, and conjunctivitis) account for 40%. This indicates a strong relation with environmental contamination and water use. The remaining 6% is related with malnutrition (Figure 15).

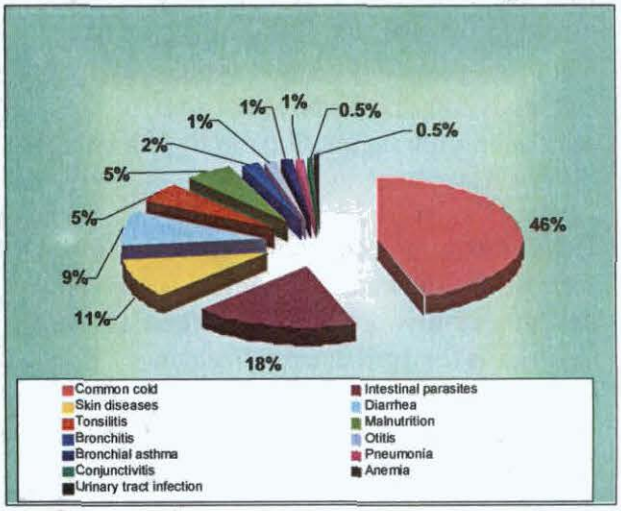

Figure 15. Most frequent diseases in the Tascalapa subwatershed.

Maize and beans are the base diet of the inhabitants of the Tascalapa River subwatershed. Rice and eggs are secondary foods, and vegetables, chicken, meat, and milk products are infrequently eaten (Figure 16). The estimated consumption of basic foodstuffs per family of 6 people in the region is about 1.12 tons per year of maize, 0.6 tons per year of beans, and 0.22 tons per year of rice.

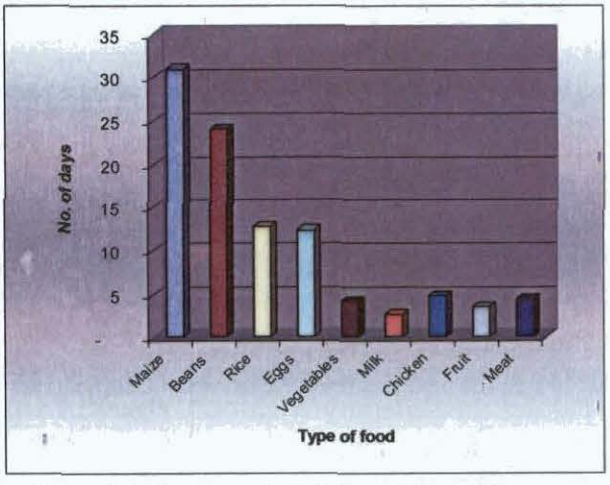

Figure 16. Consumption of foodstuffs by the population of the Tascalapa subwatershed

The lack of integration of production chains and diversification of activities around coffee, forestry, meat and milk products, and other potential products has led to 18% of the population emigrating to other cities of the country and to the United States. In the economically active population (15-49 age group), migration is at 36.7%. In the subwatershed, temporal migration also occurs. This occurs when people leave to work elsewhere at a time when there are few activities on their own farms. This migration starts in November and April, mainly for cleaning and cutting coffee (56%), and secondly in the manufacturing industry (17%) located in the north of the country (San Pedro Sula and Choloma)(Figure 17). The average age of persons carrying out off-farm work is 33, with the range varying between 14 and 83. This type of off-farm migration is more frequent among men.

Options and actions

From the results of the research work carried out in the Tascalapa River subwatershed, a monitoring plan has been established with the Comité Local para el Desarrollo Sostenible de la Cuenca del rio Tascalapa (CLODEST) and the Municipality in the Tascalapa River subwatershed with the aim of obtaining comparisons over time on the indicators on quantity (volume m^3/s) and quality (pH, alkalinity, nitrates, phosphates, hydrogenation potential, oxygen dissolved, cloudiness, conductivity, total solids dissolved, and fecal coliforms).

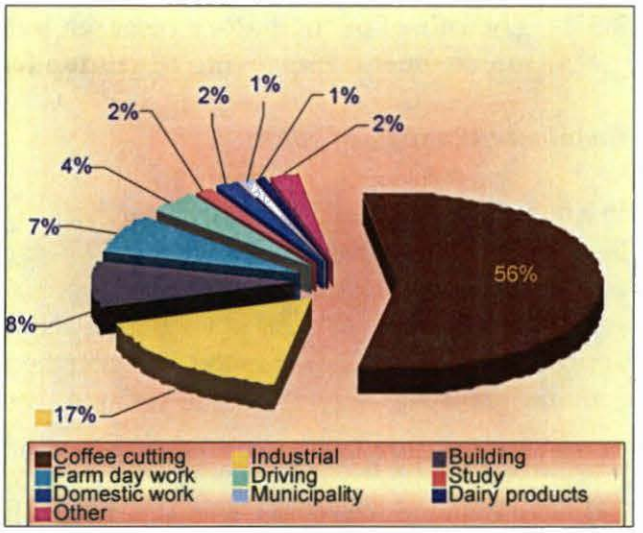

Figure 17. Types of off-farm work carried out.

The first results on the state of the water using 12 points of the monitoring for use as potable water, according to the Honduran national regulations, indicates that nitrate concentrations, conductivity, total solids dissolved, pH, and oxygen dissolved are suitable in all sample sites. Fifty percent of the subwatershed stations have some limiting parameters necessitating applying conventional treatment for making the water potable. The Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD) showed high values in all monitoring stations, beyond the recommended limits, and conventional treatment should be used. The presence of fecal coliforms showed critical values in Before Quebrada Sulaquito and Quebrada Sulaquito stations (Table 3).

Table 3. State of the water in the different monitoring points for potable water, Tascalapa River subwatershed, Colombia.

Parameters[a]	Monitoring points[b]											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Nitrates	A	A	A	A	A	A	A	A	A	A	A	A
Phosphates	A	A	A	A	B	B	B	A	B	B	A	B
Conductivity	A	A	A	A	A	A	A	A	A	A	A	A
TDS	A	A	A	A	A	A	A	A	A	A	A	A
Turbidity	A	A	A	B	B	A	A	A	A	B	B	B
pH	A	A	A	A	A	A	A	A	A	A	A	A
Dissolved oxygen	A	A	A	A	A	A	A	A	A	A	A	A
COD	Exc	Exc	Exc	Exc	Exc	Exc	Exc	Exc	Exc	Exc	Exc	Exc
BOD	Exc	B	Exc	B	Exc	Exc	Exc	Exc	Exc	Exc	Exc	Exc
Fecal coliforms	A	A	Exc	B	B	A	B	B	B	B	Exc	A

a. TDS, total dissolved solids; COD, Chemical Oxygen Demand; and BOD, Biochemical Oxygen Demand.

b. (1) Mouth of the Tascalapa River, (2) After Poblado Luquigue, (3) Before Quebrada Sulaquito, (4) After Q Sulaquito, (5) Before the mouth of the Tascalapa River, (6) Ojo de Agua spring, (7) Mouth of the Ojo de Agua Tascalapa, (8) Upper Jalapa (9) Lower Jalapa, (10) Q. Membrilla, (11) Q. Sulaquito, (12) Upper Q. Arriba. Category A: needs disinfecting for use. Category B: needs conventional treatment for use. Exc: range exceeded.

2.3.2 The role of participatory research by youth in food security and natural resource management: improving education for rural development

Economic situation of youth

In a survey carried out on young researchers in relation to their future, most (74%) mentioned their wish to continue studying, almost 11% aspiring to a university degree. The areas of interest are engineering (26%), medicine (13%), agriculture (7%), and other (28%). Of the total surveyed, 23% want to carry out different activities in the region, and 3% want to work in agriculture. The population in the subwatershed depends generally on agriculture and forestry activities; however only 7% of the young researchers want to study for these careers.

Forty five percent of young people want to stay in the region for family or friendship reasons, 24% like living in the region, and 31% have other reasons. Young people's motives for leaving the region are: lack of employment (41%); lack of options to continue studying (19.7%); not liking the region (19.7%); there is no development (9.8%); and other reasons (9.8%).

As part of this situation related with education and emigration of the region's youth, the C&W Project and its partners (Instituto San Pedro [ISP]; Fundación para la Investigación Participativa con Agricultores [FIPAH]; CLODEST; and the municipality) have strengthened their focus of work with young rural researchers at watershed level.

In the subwatershed, the nine groups of young researchers total 166 members—87 men and 79 women. Each group is carrying out a research theme in production or natural resource management. Seven of the nine groups established 8626 plants in nurseries (6304 forest species and 2322 fruit trees), and planted out 6824 at different sites (Table 4). The junior Comités de Investigaciónes Agrícolas Locales (CIALs) harvested a diversity of vegetables.

Table 4. Production of forest plants and fruit trees, reforestation sites, and other activities of the groups of young researchers, 2003-04.

CIAL community[a]	Production of plants in nurseries		Units planted	Sites of reforestation	Other activities
	Forest	Fruit			
Futuro Mejor (Hillsides)	3000	20	2800	Springs Riverside zones in broken terrain Recreational areas and house plots	Production of 182 kg vegetables and 100 (units) cucumbers Installation of improved stove
Nuevo Horizonte (Wisilka)	1500	-	1300	Plantation of fuel woods Recreational areas and house plots Delivery of plants to other CIALs	Production of 105 kg vegetables and 100 sweet potatoes Bio-intensive gardens
Nuevo Despertar (Sabana de San Pedro)	450	-	450	Recreational areas and house plots	Production of 40 cucumbers

Continued.

Table 4. (Continued)

CIAL community[a]	Production of plants in nurseries		Units planted	Sites of reforestation	Other activities
Jóvenes Progresivos (Jalapa)	404	2078	1250	In house plots Riverside zone in broken terrain at Ojo de Agua	Production of 40 kg of maize, 56 kg of vegetables, and 300 chilies
Sueños Juveniles (Yorito)	650	-	500	Recreational areas and house plots Riverside zone in broken terrain at Pimienta	Production of 12 kg basic grains
Los Pinares (Luquigue)	300	-	300	Riversides Recreational areas and house plots	Production of 162.5 kg of vegetables and 100 cucumbers
Unión y Esfuerzo (San Antonio)	-	-	-	-	Production of 2000 chilies and 400 kg of maize Bio-intensive gardens Cleaning campaigns
Jóvenes Unidos (ISP)	-	224	224	Properties of the ISP	Production of 70.5 kg of basic grains and 110 radishes
Jóvenes en acción (ISP)	-	-	-	-	Production of 221 kg of basic grains and 190 cucumbers
Nueva Esperanza (ISP)	-	-	-	-	Bio-intensive gardens Hydroponic crop
Arco Iris (ISP)	-	-	-	-	Evaluation of guava varieties

a. CIAL, Comité de Investigación Agrícola Local; ISP, Instituto San Pedro.

The bio-environmental wetland of Yorito

The groups of young researchers of the ISP have measured water quality (turbidity, conductivity, total dissolved solids [TDS], pH, and dissolved oxygen) three times, both before and after the wetland. The results obtained indicate that the parameters for turbidity and dissolved oxygen show significant differences in quality (Figures 18 and 19). This indicates that the wetland fulfills a function in the quality of the water that is filtered through it. The values of TDS, pH, and conductivity show no significant differences, but exit data show a slight tendency towards improvement.

Since the construction of the wetland in 2003, various adjustments have been made to the original design to increase efficiency: (a) installation of metallic filters for the retention of thicker wastes, (b) construction of another dyke and filling with gravel, (c) fencing of the area and sowing of the legume *Gliricidia sepum*, and (d) construction of the water entry canal with two rows of blocks.

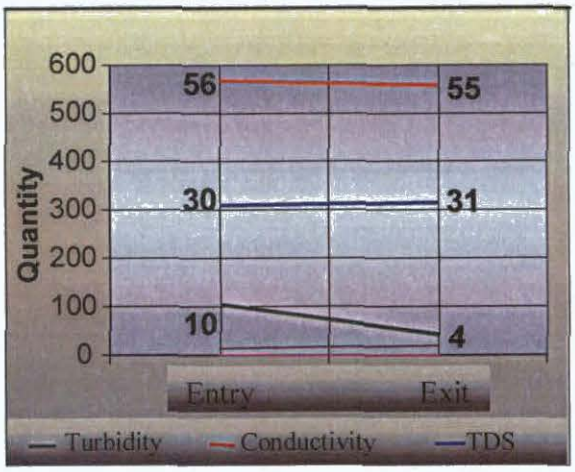

Figure 18. Effects of the wetland on the quality of water (TDS = total dissolved solids).

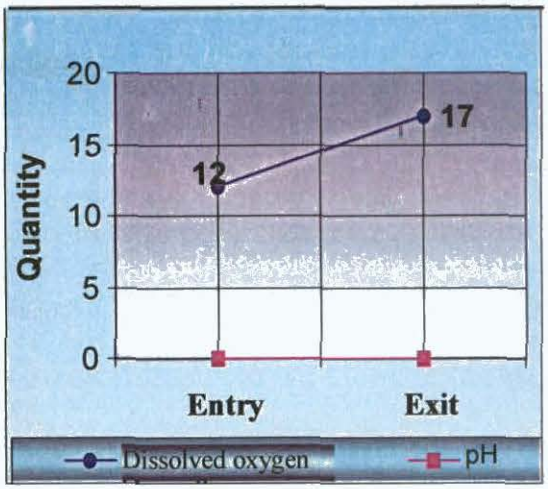

Figure 19. Effects of the wetland on residual waters of the municipality of Yorito.

Fuel wood species

The deficiency of electric power as indicated in the base line, leads to firewood becoming the main source of energy at rural level. Facing this problematic, the young researchers for a better future of the community La Ladera evaluated four fuel wood species: *Leucaena*, Neem (*Azadirachta indica* A. Juss.), Guama (*Inga* spp.), and Teca (*Tectona grandis* L. f.). *Leucaena* shows the best growth compared to the other three (Figure 20).

This increase of growth in height has been highly significant, thus it is an alternative for these regions where the availability of firewood is needed permanently.

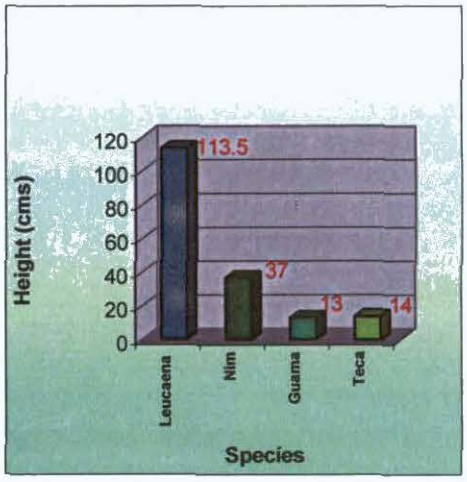

Figure 20. Growth gain in fuel wood species.

Training and visits

The young researchers were trained in bio-intensive gardening (with the support of the UBC) and in computing. Representatives of government institutions (Minister of the Secretaria de Recursos Naturales y Ambiente [SERNA], Viceministers of the Secretaria de Agricultura y Ganadería [SAG] and of the Dirección de Investigación de Ciencias y Tecnología Agrícola [DICTA]), international cooperation (Agricultural Cooperative Development International [ACDI]-Canada-Honduras-Nicaragua, and the Swiss Agency for Development and Cooperation [SDC]) visited the project. The mayor of the Municipality of Dovio, Colombia and the Director General of CIAT also visited.

2.4 Calico Watershed, Nicaragua

- Base line structured from the minimum set of indicators for the analysis of watersheds developed by the C&W Project and linked to the research framework. Updating of data corresponding to the indicators supported by the municipality and local partners.
- Thirty-nine professionals of the alliance were trained in methodologies in Integrated Watershed Management: 22 from the Instituto Nacional de Tecnología Agropecuaria (INTA), three from the Universidad Nacional Agraria (UNA), three from CARE International, three from CIAT, one from each of the municipalities of San Sebastián de Yalí, San Rafael del Norte, La Concordia, and San Dionisio, one from the Universidad Nacional de Nicaragua (UNN), and three research staff of the Universidad Nacional Autónoma de Nicaragua (UNAN), Matagalpa.

2.4.1 Base line

Because of the inconsistent and incomplete information on the subwatershed of the Calico River (Figure 21), the Comité de Desarrollo Municipal (CDM) decided collect information to establish the base line with the minimum set of indicators proposed by C&W and jointly planned with local actors. These indicators allow analysis of the socioeconomic interactions with natural resource management in the subwatershed.

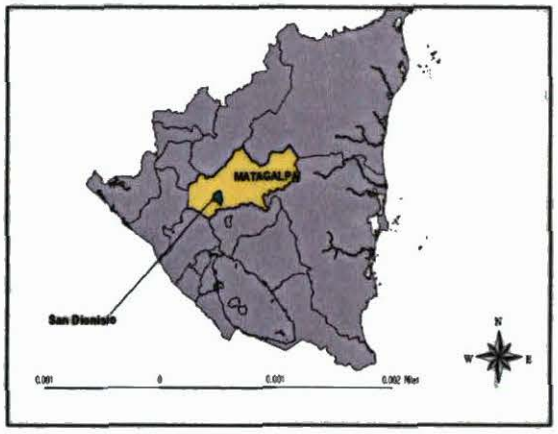

Figure 21. Location of Calico subwatershed.

Different local actors are contributing to this base line and, to date, the information for the Wibuse/Jicaro microwatershed is processed and analyzed (Orozco et al., 2004 – see under 5.1.3). This microwatershed has a population of 2020 (about 51% women) that corresponds to 353 families and is distributed uniformly over the area. About 36% of the population is between the ages of 19 and 49 (active population). Young people between 10 and 18 years of age represent nearly 25% of the total.

Access to basic services is deficient. Almost 95% of the population has no electricity, 100% has no potable water, and 60% have piped water, but only 37% of these have house connections. Natural wells represent the second source of water supply (43% of the population), and 10% of the population gets water from streams. Almost 32% of the population has no latrines and of those who do, about 60% are considered in bad state (old, without lids, etc.) (Figure 22). Consequently, there is a strong presence of gastrointestinal diseases (diarrheas and parasitism) with about 19% frequency in the population of the municipality of San Dionisio (Figure 23).

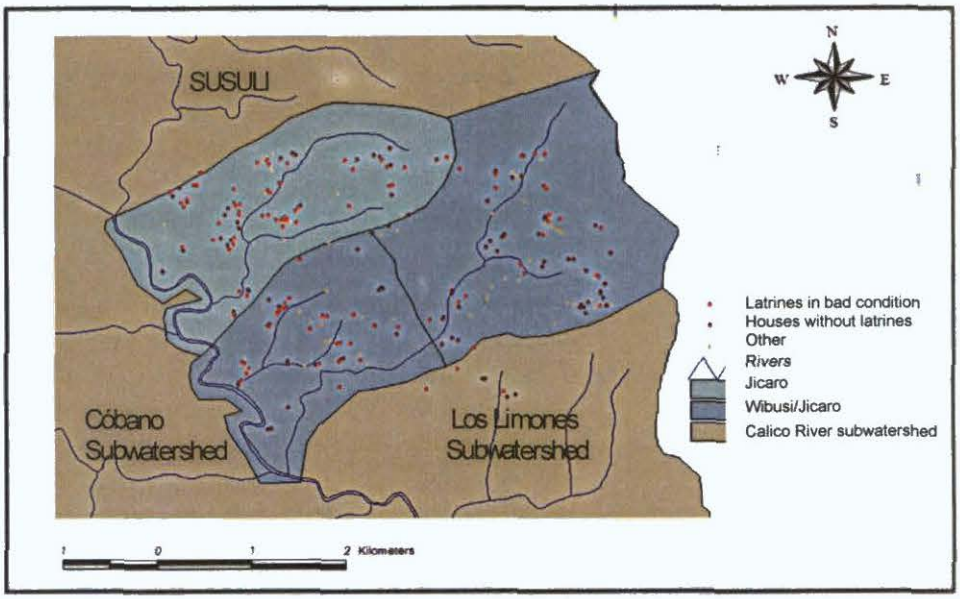

Figure 22. Families without use of latrine and latrines in bad condition, Wibuse/Jicaro microwatershed, 2004.

Access to land

For access to land, the population is distributed into four types: (1) 28% of farmers own enough land and only work on their own farms; (2) 25% own land, but not enough, and need to rent or borrow land for production; (3) 40% rent or borrow land; and (4) 7% own no land and live by their labor.

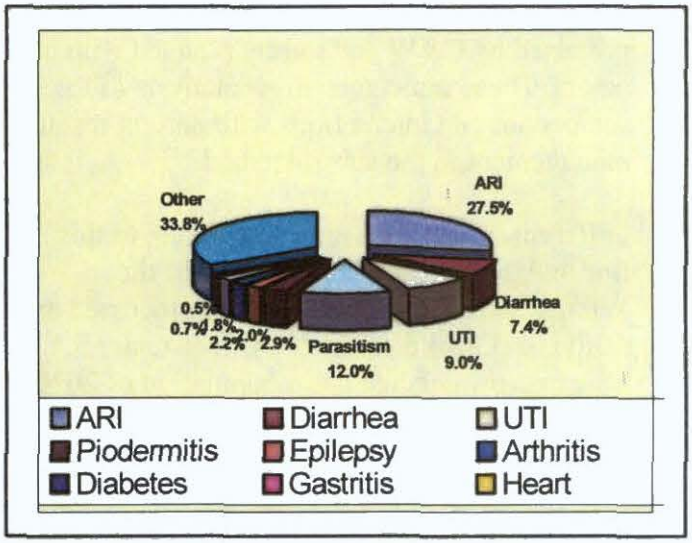

Figure 23. Most frequent illnesses in the municipality of San Dionisio (ARI, acute respiratory infection; UTI, urinary tract infection).

Sources of income

The main economic activities are centered in agriculture and agricultural work. The main source of income is the cultivation of beans (90% of population), followed by maize (89%), off-farm labor market (80%), coffee (33%), fruit trees (21%), sorghum (13%), and vegetables (11%). Other activities such as cattle farming, rice cultivation, crafts, and commerce represent less than 5%.

Migration

In 55% of families, at least one member emigrates (Figure 24). Of this percentage, 42% leave for another municipality of the country (to cut coffee, for domestic labor, commerce, and duty-free zone), about 28% practice flood irrigation of beans (interior of the country from December to April), and 11% have migrated to another country (Costa Rica and USA). Of the families that

own their own land about 40% emigrate; while of those without land (only rent or borrow land) about 66% emigrate.

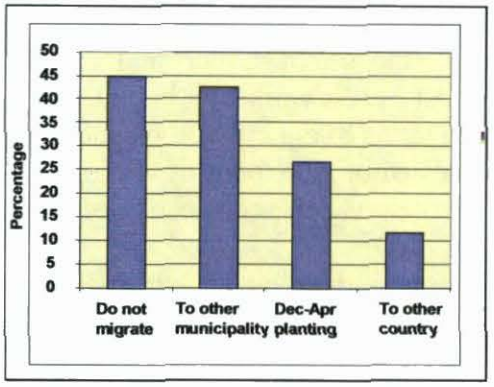

Figure 24. Wibuse/ Jicaro population migration.

Options and actions

With the aim of understanding the interrelations between land use, water quality, and human health, a monitoring process of water quality and quantity in the microwatershed was initiated. Eight sample sites were established: (1) at the confluence with the Calico River, (2) the source of the Jicaro River, (3) union of two channels, (4) confluence with Las Mesas, (5) central confluence with Las Mesas, (6) source of Las Mesas, (7) central Wibuse water intake, and (8) source of central Wibuse River. Table 5 presents results of a first sample and indicates that the water quality index using the Biological Monitoring Working Party score system (BMWP) fluctuated between poor and average in the monitoring stations. The minimum value was observed in the station after the union of the two channels. This minimum value of the index possibly is because at this point the channel has received contaminants that have been swept along by the current in the two channels, one coming from the plateau sector and the other passing close to Central Wibuse. After this station, the water improves in quality before the confluence with the River Calico. This situation of water quality can be related to the state of latrines indicated in the base line.

Table 5. State of water in the monitoring points for potable use.

Parameters[a]	Monitoring points[b]							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nitrates	A	A	A	A	A	A	A	A
Phosphates	A	A	A	A	A	A	A	A
Conductivity	A	A	A	A	A	A	Exc	Exc
TDS	A	A	A	A	A	A	Exc	A
Turbidity	Exc	A	Exc	A	Exc	A	A	A
Hardness	Hard	Hard	Medium	Medium	Medium	Medium	Hard	Medium

a. TDS, total dissolved solids.

b. (1) Central Wibuse source (2) Central Wibuse water intake, (3) source of Las Mesas, (4) Central Wibuse confluence, (5) confluence with Las Mesas, (6) union of the two channels (7) source of Jicaro River (8) confluence with Calico River. Category A: needs disinfecting for use. Category B: needs conventional treatment for use. Exc: range exceeded

2.4.2 Project in strategic alliance (INTA, UNA, CARE, and CIAT) for integrated watershed management

The new framework of policies for the productive rural development of Nicaragua frames INTA's Strategic Plan 2003-07, and within this is included the focus on integrated watershed management of the institutions, under the research line – generation of promising technologies.

With the aim of supporting INTA in its strategy of adopting integrated watershed management, CIAT held a workshop in 2003 for technicians (mostly agronomists dedicated to extension programs of agricultural technology) with the objective of strengthening the concepts and use of tools within the focus of watersheds. Also incorporated was the revision of criteria used by INTA for the preliminary selection of microwatersheds in the country.

This activity allowed carrying out the project "Facing the millennium challenge: the INTA and other partners of the alliance (UNA, CARE, and CIAT) are strengthened in the focus on integrated watershed management", in the pilot areas of the rivers Calico (San Dionisio-Matagalpa) and Viejo (La Concordia and San Rafael del Norte – Jinotega), financed by the Fundación para el Desarrollo Tecnológico Agropecuario y Forestal de Nicaragua (FUNICA). Figure 25 shows the location of the pilot areas.

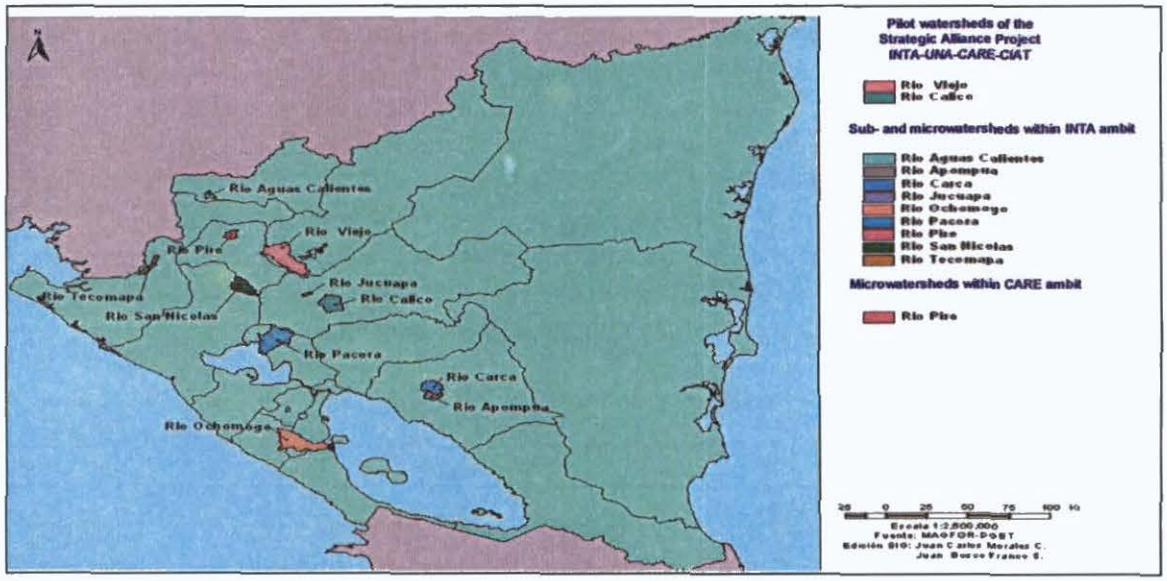

Figure 25. Location of pilot subwatersheds of the Strategic Alliance Project, Instituto Nacional de Tecnología Agropecuária (INTA)- Universidad Nacional Agraria (UNA)-CARE International-Centro Internacional de Agricultura Tropical (CIAT), and subwatersheds within the ambit of INTA and CARE, Nicaragua, 2004.

Proposed results

(1) A base line established with indicators for the integrated watershed management.
(2) Identification of environmentally and socially sensitive areas (ESSA).
(3) Strategies of conservation and intervention implemented for these ESSA areas.
(4) A plan for territorial planning established.
(5) A monitoring and evaluation system implemented.

Results obtained

Table 6 shows the advances and results of the project in alliance. In relation to the base line: (a) a minimum set of 50 indicators (24 priority ones) were defined with participating partners in cultural, biophysical, socioeconomic, soil-water and biodiversity, land use-production, and

community management aspects; (b) methodology established to compile quantified data with partners and municipalities; (c) information systematized through the Toolbook.

Table 6. Activities and results obtained in the Strategic Alliance Project – Instituto Nacional de Tecnología Agropecuária (INTA)-Universidad Nacional Agraria (UNA)-CARE International-Centro Internacional de Agricultura Tropical (CIAT), 2004.

Activity[a]	Results[b]
Base line	
• Indicators for integrated watershed management	❖ Definition agreed with the participating partners (INTA, UNA, CARE, UNAN-Matagalpa, municipalities, and UNN) of the biophysical and socioeconomic indicators for the region. • (Technical report: Baltodano and Bosco, 2004)
• Validation of the indicators at local level	❖ Establishment of the minimum set of indicators with the local organizations and municipality for the Calico and Viejo subwatersheds.
• Compiling and analysis of data to quantify the selected indicators	❖ Indicators quantified in aspects of: (a) culture - ethnic groups, (b) socio-economics - land ownership, education, population, migration, and health, (c) water - quality and quantity of water, infrastructure and sources of water, (d) land use and production - types of land use, crop systems, agricultural production, and management. • (Technical report: Orozco et al., 2004) • (Technical report: García and Bosco, 2004)
• Management of the Toolbook to systematize base-line information	❖ Two subwatersheds with base line information on CD • (Technical report: Escober and Bosco, 2004)
ESSA	
• Geographic information systems	❖ Production of maps of soil use, hydrological network, roads, and population settlements at a scale of 1:20 000 through CIGMAT-UNAN ❖ Interpretation and analysis of maps, geo-referencing, scaling of maps, and three-dimensional models • (Technical report: Burgos et al., 2004)
• Identification of criteria for selecting ESSA, microwatersheds, SOL, and producers	❖ Criteria established for the selection of ESSA, microwatersheds, SOL, and producers • (Technical report: Orozco and Beltrán, 2004)

a. ESSA, environmentally and socially sensitive areas; SOL, Supermercado de Opciones para Ladera.
b. UNAN, Universidad Nacional Autónoma de Nicaragua; UNN, Universidad Nacional de Nicaragua; CIGMAT, Centro de Información Geográfico del subcuenca de Rio Grande de Matagalpa. For technical reports, see under 5.1.4.

Maps have been produced at 1:20 000 scale in the pilot subwatersheds to identify the ESSA, since all existing information in the country is at scales greater than 1:50 000, not permitting analysis within the watershed at such a low level of detail.

Thirty-six officials of the institutions in the alliance and local partners have been trained (22 from INTA, three from UNA, two from CARE, three from CIAT, one each from the municipalities (mayors' offices) of La Concordia, San Rafael del Norte, and San Dionisio, and three research staff of UNAN-Matagalpa).

Strategy for moving forward

The project concentrates its research and development in two pilot subwatersheds: Calico River (CIAT reference site), and Viejo River (INTA reference site). Figure 26 shows the strategy for institutional strengthening in integrated watershed management. The participation of experts from the UBC, Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuária (CIPAV), UNA, INTA, and CIAT in themes such as indicators, GIS, ESSA, territorial planning, and monitoring-evaluation allow strengthening the abilities of teams in integrated watershed management.

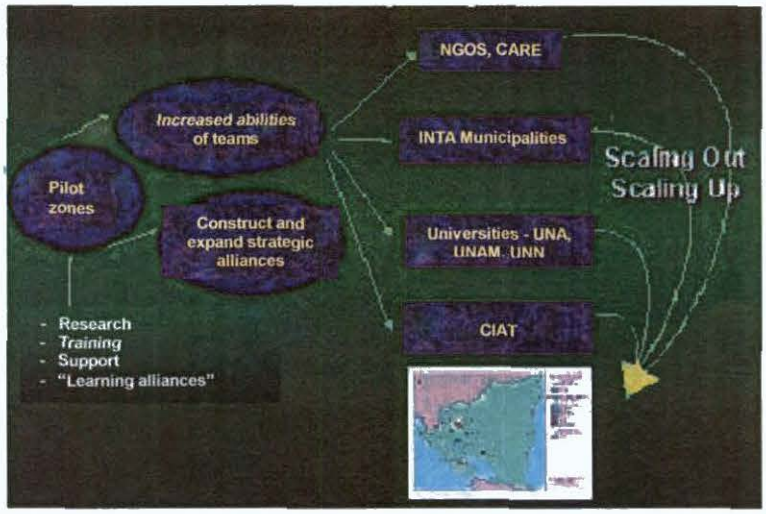

Figure 26. *Strategy for the strengthening of the Instituto Nacional de Tecnología Agropecuária (INTA), Universidad Nacional Agraria (UNA), CARE International, and Centro Internacional de Agricultura Tropical (CIAT) in integrated watershed management.*

The steps carried out in the pilot subwatersheds also will be developed principally by INTA in 10 other sub- and microwatersheds in the country, in the Pacific zone (subwatersheds Ochomogo, Juacuapa, and Pacora Rivers, Tecomapa microwatershed); northern central zone (Pires River microwatershed), Segovias zone (Aguas Calientes microwatershed, San Nicolás subwatershed), and southern central zone (microwatersheds Carca and Apompua Rivers) (Figure 25).

3. Other Projects/Collaborators

3.1 Water and Food Challenge Program (WFCP)

C&W participated in the WFCP baseline conference in Nairobi, Kenya, from November 3 to 5. Sandra Brown presented the perspective from the Andes, highlighting multi-scale approaches, the need for the collection of primary data to support policy decisions, focus on efficient water use, and water quality and comparative watershed analysis using common indicators.

A poster presentation of our project (WCP-29, Figure 27) was presented along with other successful projects (top 50). However, because of lower than anticipated funding for the WFCP, only 16 projects were initially funded. Based on logistical concerns raised by the review panel, our proposal was scaled down to the Andes only (four watersheds in three countries), and re-

written in the format of the International Fund for Agricultural Development (IFAD) for consideration. While we were not successful in soliciting IFAD support, additional wait-listed projects were recently funded by the Department for International Development (DFID), leaving C&W's scaling proposal second in the funding queue, and we continue to work closely with Jonathan Wooley, WFCP Program Coordinator, in moving our scaling project forward.

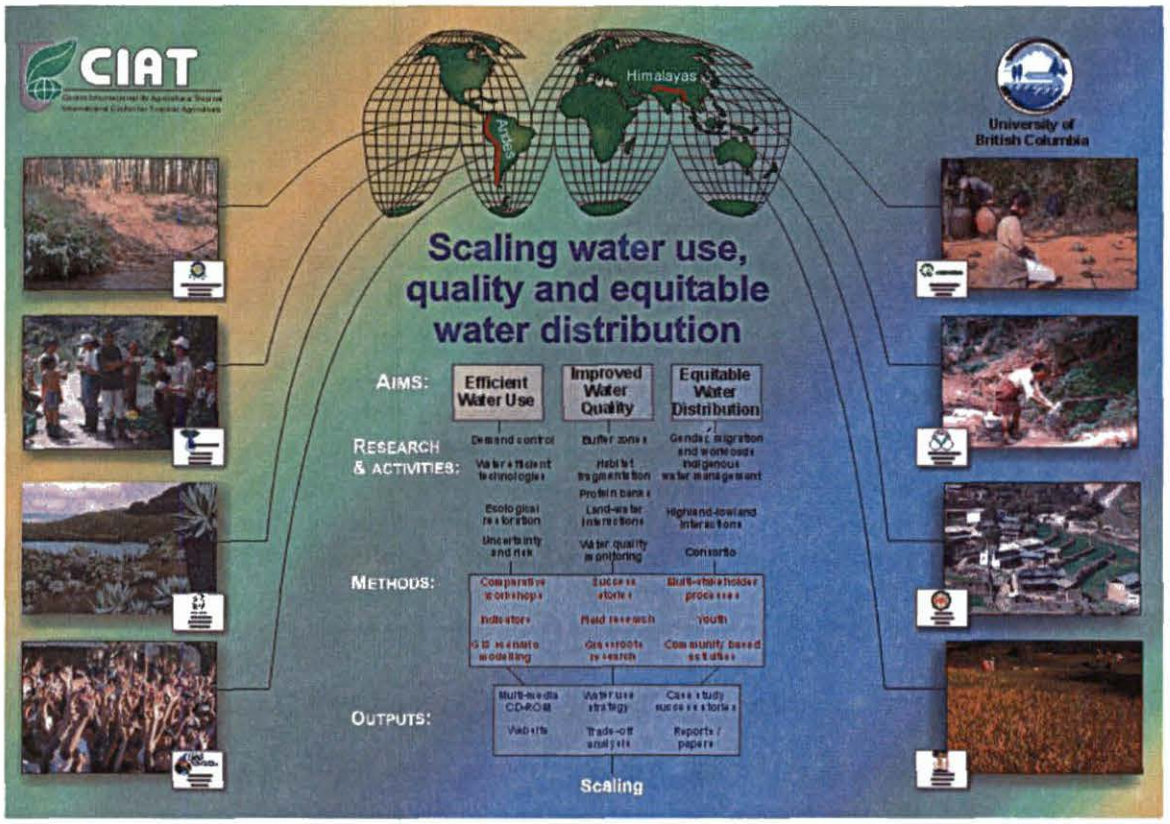

Figure 27. Poster presentation of the project submitted for the Water and Food Challenge Program.

3.2 CONDESAN

3.2.1 The Technical Committee

The Governing Board of the Consorcio para el Desarrollo Sostenible de la Ecorregión Andina (CONDESAN), in its ninth meeting (February 2004), decided to reactivate the Technical Committee (TC) under a new format. Thus the TC will be made up of technical representatives of the "CONDESAN initiatives" (regional projects and CONDESAN sites), one representative from the Centro Internacional de la Papa (CIP), and one from CIAT. The participation of these last two organizations as full members of the TC is essential to continue supporting the permanent construction of CONDESAN.

The main role of the TC is to work on the synthesis and integration of knowledge in present and future CONDESAN projects, propose or design mechanisms for this, construct synergies among partners, and identify priorities and opportunities for the consortium.

Nacho Sanz has been appointed from September 2004 as the new representative for CONDESAN's TC on behalf of CIAT. Rubén Darío Estrada from CONDESAN-CIAT and his team continue to be stationed within our project in CIAT, where we maintain a permanent mutual collaboration in all aspects of integrated watershed management for the Andean region.

The Coordination Unit of the TC is organizing the TC's first technical meeting in the new format from 8-10 November 2004. This meeting will be a seminar on water, ecosystems, and development and will constitute the first experience of the new TC for the synthesis and integration of knowledge.

3.2.2. Proposal funded for C&W to work in CONDESAN's pilot watershed in Bolivia

The Consultative Group on International Agricultural Research- Canadian International Development Agency (CGIAR-CIDA) Canada Linkage Fund approved our 3-year proposal "Youth Bolivia: alliance for water-science and the future". With this proposal we will attempt to build local capacity where youth is involved in the science of integrated water management in the Tiquipaya watershed in Cochabamba, CONDESAN pilot site. A scientific study is underway with the participation of youth as co-investigators, with the aim of creating capacity to carry out investigations and integrated studies related to the use of water (balance and quality). The activities include the design, management, and analysis of recognition related to the use of water at farm level and the participative determination of sensitive environmental areas. The proposal is a collaboration between our C&W Project, the Comité Gestión Integral del Agua en Bolivia (CGIAB) of Bolivia, and the UBC of Canada.

3.2.3. C&W within the framework of CONDESAN and the WFCP

The CP Secretariat of the Water and Food Challenge Program (WFCP) is actively seeking finance for approved projects, beyond the approximate 20 for which funds already are available. Our proposal, no. 29, is one of those approved without available funding as yet. Among donor visits and contacts, Jonathan Wooley, WFCP Program Coordinator, has had extensive recent e-mail and in-person discussions with Rudolph Cleveringa, IFAD's Water and Rural Development Advisor, and his colleagues, following up on Frank Rijsberman's original in person and email contacts.

Roberto Haudry from IFAD-Lima informed Hector Cisneros, Coordinator of CONDESAN that he was very interested in seeing the proposal urgently, aiming to get funding for a scaled-down proposal concentrated on the Andes, by excluding our link with the International Center for Integrated Mountain Development (ICIMOD) because keeping that element is no longer a strongpoint. At the same time, it was our decision to scale the project down to encompass only the Andes, as the WFCP reviewers suggested.

While we were not successful in soliciting IFAD support (selected proposals were related to environmental services directly), additional wait-listed projects were recently funded by DFID, leaving PE3's scaling proposal no. 2 in the funding queue. We continue to work closely with Jonathan Wooley in moving our scaling project forward.

In its virtual meeting, 8-28 September 2004, the WFCP Steering Committee decided not to proceed for the present with the second call for proposals for research projects that was expected to be published in October. The reason for this was a key comment expressed by the CGIAR Science Council expressing that what the CGIAR has lacked has been the ability to "add value" from the research on the component parts to impact on water productivity at a basin level. Once the WFCP moves ahead with its second call for proposals, we are thinking about a research proposal related to governance, including water balance as one component, and linking Colombia, Ecuador, and Bolivia.

3.3 Seeds of Hope

3.3.1 Honduras

From 2001 to 2003, the European Union financed a project based on food security and commercialization of production surplus, "Production and commercialization of improved and diversified artisanal seed".

The project developed in Honduras with eight nongovernmental organizations (NGOs):

- Instituto para la Cooperación y Autodesarrollo (ICADE),
- MOVIMONDO,
- the GUIA group,
- Consultores Luchando Profesionalmente con Experiencía (CONSULUPE),
- World Neighbors,
- Comisión Cristiana de Desarrollo (CCD),
- Asociación para la Participación al Desarrollo (APS), and
- Comité Internacional para el Desarrollo de los Pueblos (CISP).

These are located in the departments of Ocotepeque, Santa Bárbara, El Paraíso, Francisco Morazán, and Colón, in zones with strong food security, environmental vulnerability, economic, and social problems. The poorest communities of Honduras live here, including the Lenca ethnic group, as in the west (CCD and World Neighbors), and in Garífunas on the Atlantic Coast (CISP). A poor racially mixed population also lives in these departments where the Seeds Project is carried out.

The project's zone of influence includes 27 municipalities and 85 communities, where 393 producers, of which 62 are women (16% of total population), were directly benefited with basic grain and vegetative material. The NGOs selected these producers based on their experience in producing basic grain, serious approach, commitment, permanence in the region, and capacity to carry out activities in a joint manner with other farmers.

Training

During the project's 2½ years, the Food and Agriculture Organization of the United Nations (FAO), CIAT, and the Servicio Nacional de Sanidad Agropecuária (SENASA)-SAG have trained eight NGO technicians and producers selected for their capacity to understand different aspects related to seed production and the management of soil and water resources.

CIAT gave courses on the production of seed of basic grain (maize, beans, rice, sorghum, and soya), seed postharvest techniques (Figure 28), cost production and value-added calculations, commercialization, and varietal descriptors.

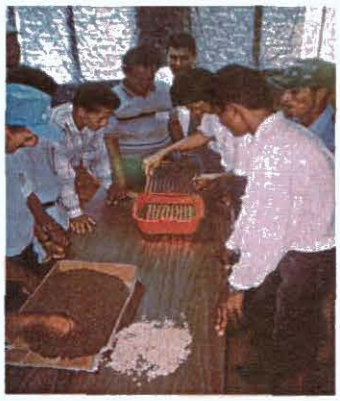

Figure 28. Technicians and farmers being trained in germination testing.

Also, a course was held for technicians on the methodology developed by the Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) for recuperating and/or maintaining improved or native open-pollinating varieties of maize through the system of cob per row or half-brothers. With the aim of strengthening the technicians' ability and knowledge, a course was given on the management of computer programs (Figure 29), since technicians need to be strengthened so that they can better present reports.

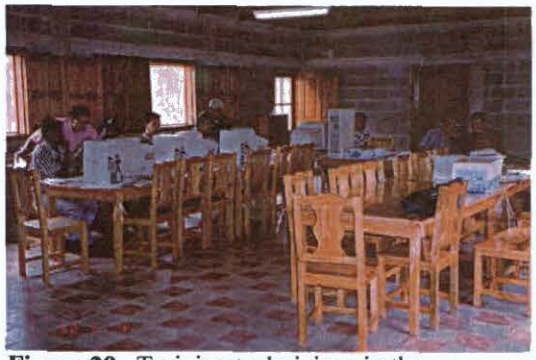

Figure 29. Training technicians in the management of computer programs.

The SENASA-SAG office gave support on Certification and Quality Control, as well as norms and standards of quality in the field and laboratory (Figure 30).

The FAO gave various courses directed at watershed management, fertilizer management, production systems in hillsides, technology validation, and water management. FAO and CIAT jointly gave a course on the agronomic management of vegetative materials (Table 7). In response to this training, technicians of the different NGOs trained by FAO and CIAT themselves trained 699 producers in their respective communities, multiplying the training received by over 400%. This training was developed through 1-day work modules and according to crop or theme, as shown in Table 7.

Figure 30. Technicians of the project receiving training on quality control in the laboratory.

The efforts of 322 producers and the support of the technicians produced, on 243 *manzanas*[2] (mz, about 176 ha), 3732 *quintales*[3] (qt, about 170 t), of basic grain (bean, maize, rice, soya, sorghum, wheat, and barley), of which 2571 qt (117 t) were grain and 1161 qt (53 t) seed. With the

[2] 1 manzana (mz) = 7642 m^2.
[3] 1 quintal = 45.45 kg.

sale of these, producers received 555,506 Lempiras[4] (about US$30,190). This seed reached 818 producers through direct sale in the communities (368 producers / 42.5 t), or by sale at institutions such as the Red Cross and Euroaid (450 producers / 10 t), who distributed it in 17 municipalities and 21 communities.

Table 7. Centro Internacional de Agricultura Tropical (CIAT) and Food and Agriculture Organization (FAO) training given to technicians and producers of the different nongovernmental organizations (NGOs), and by the technicians to producers in the zone of influence.

Course	No. trained	Date	Given by	NGO response to the training:	
				NGO[a]	Producers trained (no.)
Bean and maize production and postharvest management	8 technicians 24 producers	1-6/3/01	CIAT	APS	98
Rice, soya, and sorghum production and postharvest management	8 technicians 24 producers	16-20/7/01	CIAT	CCD	13
Computer program management	8 technicians	4-6/3/03	CIAT	World Vision	0
Varietal description and recuperation of maize varieties	8 technicians 24 producers	7-9/3/03	CIAT	CISP	62
Watershed management	7 technicians	23-26/4/02	FAO	ICADE	244
Fertilizer management	7 technicians	19-24/5/02	FAO	MOVIMONDO	165
Technology validation	8 technicians	16-22/6/03	FAO	GUIA group	117
Production systems in hillsides	8 technicians	16-22/6/03	FAO	CONSULUPE	0
Workshop on water management	8 technicians	16-20/7/03	FAO	-	-
Agronomic management of vegetative materials	8 technicians	5-8/8/02	FAO/CIAT	-	-
Course on silk-screen printing (labeling)	8 technicians 16 producers	7-9/10/03	CIAT	-	-
Total	174				699

a. APS, Asociación para la Participación al Desarrollo; CCD, Comisión Cristiana de Desarrollo; CISP, Comité Internacional para el Desarrollo de los Pueblos; ICADE, Instituto para la Cooperación y Autodesarrollo; MOVIMONDO, NGO for international cooperation and solidarity, and CONSULUPE, Consultores Luchando Profesionalmente con Experiencia.

Fifty mz (36 ha) of vegetative material—cassava, plantain, *malanga* (*Colocasia esculenta* [L.] Schott), *pataste* (*Sechium edule* [Jacq.] Sw), pineapple, *ayote* (*Cucurbita moschata* Duchesne), and sweetpotato— were planted with the participation of 87 producers in 14 municipalities and 36 communities. With the product of this effort, 41 communities and 116 producers were benefited. Producers received 23,165 Lempiras (US$1259) for the sale of this seed. This result is mostly due to the enthusiasm and commitment of technicians and producers.

[4] 18.4 Lempiras = US$1 in 2004.

Parallel to these activities, and outside the project framework, new improved germplasm was validated, such as Amadeus and Carrizalito beans, from Zamorano, and four cultivars of sweetpotato from the Supermercado de Opciones para Ladera (SOL) site.

3.3.2 Nicaragua

The Campos Verdes Association, located in the municipality of San Dionisio, department of Matagalpa, has been affected by a government program of "pound for pound", which benefits producers through a subsidy for seed purchase. The aim of this program is for producers to use hybrid and improved variety seed. It began by giving producers the opportunity of having seed at a 60:40 ratio where the government supplied the larger percentage and the producer the lesser. However, at the end of the project, producers ended up paying 100% of the seed value. But in years 1, 2, and 3 of the project, this subsidized percentage affected producers of the Association who could not compete, even though the price of their seed was cheaper than the 100% that was finally paid.

3.4 Southeast Asia -- Participatory Research for Development in the Uplands (PRDU) Project

IFAD provides funding for the PRDU Project (2003-2007) through a technical assistance grant (TAG-607: Programme for Integrated Upland Agricultural Development Using Participatory Approaches in China, Laos, and Vietnam). CIAT and CIP jointly implement the project, which works alongside five new and existing IFAD-funded development projects in the People's Republic of China, the Lao People's Democratic Republic, and the Socialist Republic of Viet Nam (Table 8).

Table 8. Location of International Fund for Agricultural Development (IFAD) investment projects and Participatory Research for Development in the Uplands (PRDU) project focus villages.

Location (Country/Province)		IFAD Investment project	Location of PRDU focus villages	Ethnic groups	Watershed
China	Guangxi	West Guangxi Poverty Alleviation Project (WGPAP)	Long'An county	Zhuang, Han[a]	Yong River
Lao PDR	Oudomxay	Oudomxay Community Initiatives Support Project (OCISP)	Houn, Pak Baeng districts	Khammu	Baeng River (tributary of Mekhong River)
	Xieng Khouang	Xieng Khouang Agricultural Development Project (XADP)	Phaxay, Phoukout districts	Phouan, Hmong, Lao Loum[a]	Nguem River (tributary of Mekhong River)
Viet Nam	Tuyen Quang	Rural Income Diversification Project (RIDP)	Yen Son, Ham Yen, Chiem Hoa districts	Tay, Hmong, Dao, Kinh[a]	Lo River (tributary of Red River)
	Ha Giang	Ha Giang Development Project for Ethnic Minorities (HPM)	(Selection pending start of new phase)	Tay, Hmong, Dao, Kinh	Lo River (tributary of Red River)

a. Majority ethnic group (nationally).

The project's overall goal is to improve sustainable livelihoods of resource-poor farmers in steep upland areas through technical and institutional innovations. The project's purpose is to ensure a demand-driven approach for improving agricultural production, building on indigenous practices, and introducing new scientific developments. Research for development and training activities are concentrated at focus sites (village clusters). These were chosen as representative of the investment projects' greater target area in terms of agro-ecology, ethnicity, and client needs, and because they are reasonably accessible for training and dissemination purposes.

3.4.1 PRDU partnerships and process

PRDU's primary partnership is with the IFAD-funded investment projects and their implementing partners in the agricultural extension agencies in provincial, district (or county), and local governments. The PRDU project pilots participatory approaches and production technologies that, if proven successful, could be institutionalized by implementing partners and scaled up by the investment projects.

Following initial site visits, IFAD investment project staff and implementing partners met with CIAT, CIP, and IFAD technical advisory staff at a start-up Stakeholders Workshop (held in Vientiane, Laos in September 2003) to choose focus sites and discuss potential research and training activities for the first project year. Stakeholders defined a crop and livestock research agenda aimed at improving food security and increasing household income. Training workshops and on-farm trials were implemented with three of the investment projects (Xieng Khouang and Oudomxay in Laos, and Tuyen Quang in Viet Nam) during the first project year (August 2003 to July 2004).

First-year activities were reviewed and plans for the second project year were discussed at a project Steering Committee Meeting, held in Vientiane, Lao PDR in August 2004. Follow-up and monitoring of existing trials continues during the remainder of 2004 in Xieng Khouang, Oudomxay, and Tuyen Quang. A training workshop is planned for Guangxi, China later in 2004 to prepare for on-farm trials in focus villages there early in 2005. Support to the IFAD investment project in Ha Giang (Vietnam) will begin after start-up of a new phase of that project (in April 2005).

The PRDU Project engages in active partnerships with research institutions in China, Lao PDR, and Viet Nam (Table 9) to support research and training activities with investment projects. In many cases, competencies of partners in the agricultural research systems were developed through previous associations with CIAT and CIP projects.

CIAT and CIP have both complementary and overlapping strengths, which are (or will be) applied in the implementation of PRDU research for development and training activities. Major inputs from CIP will be in training and field research support, particularly in participatory approaches, technical inputs in germplasm introduction/evaluation and crop production-utilization, and participation in the planning, monitoring, and evaluation with IFAD investment projects. CIP's Hanoi Office plays an active role in crop-livestock systems research in Vietnam that relates closely to the technology interventions identified by investment projects.

Table 9. Participatory Research for Development in the Uplands (PRDU) partnerships with agricultural research systems in China, Lao PDR, and Viet Nam.

Country	Agricultural research system	Research theme
China	Chinese Academy of Tropical Agricultural Science (CATAS)	Forages, maize, participatory methods
	Guangxi Subtropical Crops Research Institute (GSCRI)	Cassava, participatory methods
Lao PDR	National Agriculture and Forestry Research Institute (NAFRI) ♦ Agricultural Research Center (ARC) ♦ Northern Agriculture and Forestry Research Center (NAFRC) ♦ Livestock Research Center (LRC) ♦ Forest Research Center (FRC, NTFP Unit)	Cassava, maize, sweetpotato, forages, participatory methods, non-timber forest products (NTFPs)
Viet Nam	Department of Science and Technology (DoST) ♦ National Institute for Animal Husbandry (NIAH) ♦ Food Crops Research Center (FCRC) ♦ Vietnam Agricultural Science Institute (VASI)	Forages, participatory methods, cassava sweetpotato, feed processing
	Thai Nguyen University of Agriculture and Forestry (TUAF)	Cassava, maize, participatory methods

Several of CIAT-in-Asia's current projects are contributing to PRDU's support to IFAD-funded investment projects (Table 10). The Small-scale Agro-enterprise Development in the Uplands (SADU) Project (funded by SDC) shares two sites with PRDU. A SADU-initiated market analysis in Xieng Khouang indicated potential price benefits for peanuts produced during the dry season. (This is a basis for proposed irrigated peanut variety trials in a Xieng Khouang Agricultural Development Project [XADP] focus village.) Two of CIAT's forages projects—the Forages for Smallholders Project (FLSP) funded by the Australian Agency for International Development (Aus-AID), and the Livelihoods and Livestock Systems Project (LLSP) funded by the Asian Development Bank (ADB)—are contributing planting materials and resources (both human and documentary) on training in participatory approaches. An SDC-funded livestock management project is providing training in animal health and veterinary practices to extension officers working with the Oudomxay Community Initiatives Support Project (OCISP) in Oudomxay. A Nippon Foundation funded project on cassava is providing PRDU with planting materials for improved cassava varieties in Xieng Khouang and Oudomxay.

Table 10. Centro Internacional de Agricultura Tropical (CIAT) projects supporting Participatory Research for Development in the Uplands (PRDU).

Project	Location	Duration
Small-scale Agroenterprise Development for the Uplands (SADU)	Lao PDR (Xieng Khouang); Viet Nam (Tuyen Quang)	Dec 07
Livelihoods and Livestock Systems Project (LLSP)	China (Hainan); Lao PDR (Savannakhet); Viet Nam (Tuyen Quang)	Dec 05
Forages and Livestock Systems Project (FLSP)	Lao PDR (Xieng Khouang)	Jun 05
Swiss Agency for Development and Cooperation (SDC) Livestock Management Project	Lao PDR (Oudomxay)	Nov 04
Integrated Cassava-based Cropping and Livestock Systems Project	Lao PDR (Oudomxay, Xieng Khouang)	Apr 09

3.4.2 Training

During the first year of the PRDU Project, four training activities were implemented: two in the Lao PDR and two in Viet Nam. Workshops on participatory problem diagnosis provided provincial and district extension staff with an introduction to participatory research approaches prior to working with villagers at focus sites and beginning on-farm trials. A training workshop is planned for Guangxi, China, scheduled for early November 2004 (Table 11).

Table 11. Participatory Research for Development in the Uplands (PRDU) training activities in 2004.

Country	Training activity[a]	Date	Project[b]	Participants (no.)
Lao PDR	Study Tour (Luang Prabang): FLSP Forage Trials in Dry Season	Mar 04	OCISP	3 provincial, 8 district extension staff
	Workshop on Participatory Problem Diagnosis and Forming Farmer Interest Groups	Mar 04	XADP	3 provincial, 9 district
			OCISP	2 provincial, 8 district
Viet Nam	Workshop on Forage and Feed Crop Technologies and Participatory Research Approaches	Jul 04	RIDP	17 provincial, 11 district, 5 commune, 6 farmers
	Study Tour (Ha Tay): Ba Vi and Ba Van Forage and Livestock Research Centers	Aug 04	RIDP	3 provincial, 5 district, 3 commune, 15 farmers
China	Workshop on Participatory Problem Diagnosis and Forming Farmer Interest Groups (planned)	Nov 04	WGPAP	Provincial, county, township (number to be determined)

a. FLSP, Forages and Livestock Systems Project.
b. OCISP, Oudomxay Community Initiatives Support Project; XADP, Xieng Khouang Agricultural Development Project; RIDP, Rural Income Diversification Project; and WGPAP, West Guangxi Poverty Alleviation Project.

3.4.3 On-farm trials

Extension staff working with PRDU implemented on-farm trials in four districts in two provinces in northern Laos, beginning in early June (Table 12). On-farm research began with participatory diagnosis of production problems and opportunities, and the formation of farmer interest groups in each of the villages. In most villages, farmers chose to implement trials by working together in groups, although in some cases individual households implemented trials.

Table 12. On-farm trials implemented by the Participatory Research for Development in the Uplands (PRDU) in the Lao PDR in 2004.

Crop	Xieng Khouang districts				Oudomxay districts			
	Phaxay		Phoukhout		Houn		Pak Baeng	
	Trials	Area (m^2)	Trials	Area (m^2)	Trials	Area (m^2)	Trials	Area (m^2)
Cassava	3	1940	6	4600	2	1600	2	1600
Forages	3	1565	8	6500	1	900	3	3650
Sweetpotato	2	650	3	1210	1	900	3	1400

So far, trials have been limited to the evaluation of introduced varieties, in comparison with local varieties. Farmers planted seven introduced varieties of cassava (from Thailand), six forage species/varieties for feeding ruminants (five grasses and one legume supplied by CIAT's FLSP), and seven varieties of sweetpotato (from Viet Nam, supplied by the Food Crops Research Center [FCRC]).

Farmers in their respective interest groups will evaluate productivity of cassava, sweetpotato, and forage varieties at harvest, and results will be shared within the community through farmer field days. In 2005, we will begin working with villagers to evaluate simple processing technologies, and to conduct trials on utilization of root crops and forages as feed resources for increasing productivity of smallholder livestock systems.

On-station trials were implemented with partners in national and provincial agricultural research systems for multiplication of planting materials (cassava), initial evaluation of new varieties (of open-pollinated maize), and to better understand fertilizer requirements on problem soils (cassava and forages planted in acid, low fertility soils in Xieng Khouang). On-station work supports the on-farm research.

In Tuyen Quang province (Viet Nam), following participatory diagnosis and formation of farmer interest groups in July and August, on-farm forage and maize variety trials are currently being planted in seven villages in four communes in three districts. Sweetpotato trials will be planted later in the autumn (November 2004). Cassava trials will be planted with the first rains in early 2005.

3.5 The Haitian Initiative

The Haitian Initiative is a series of efforts made by a team of CIAT staff members to open roads for research and capacity development in Haiti, led by the Science Park Director, with the support of the Haitian initiative coordinator, Guillermo Galvez. Participation in proposal writing and project execution has had representatives from the C&W, cassava, forages, bean, and maize (CIMMYT) projects, as well as from the training office.

During this year, efforts have been made to (1) ensure bridging funds to continue activities that were suddenly cut by Development Alternative Inc. (DAI), CIAT's contractor under the financial umbrella of the United States Agency for International Development (USAID), and (2) search for long-term commitments that ensure CIAT's presence in Haiti for a period of time in which impacts can be measured. Proposals written focused on adaptive research and commodity management on the one hand and on institutional and local capacity development on the other.

3.5.1 Seed systems and cassava processing

Bridging funds were obtained through a long negotiation period with World Vision (WV). A subcontract was signed with CIAT for US$350,000 in June 2004. Activities, which were apparently dormant during the previous months, could be maintained thanks to the commitment of the Liaison Officer in Haiti, Ing. Levael Eugene. He ensured CIAT's representation, lobbying,

and linkages with old partners and stakeholders while conversations with WV and other prospects were underway.

Implementation of the WV project started in June 2004. Three areas were favored by WV: (1) seed systems development, (2) cassava processing micro-enterprises, and (3) institutional and local capacity development in support of the other two areas of concern. This 2-year project is establishing two seed systems and two cassava processing units, all of them run by community-based organizations (CBOs) in Le Plateau Central and La Gonave, and is beginning to train WV field-staff and CBOs to develop the capacity both to apply and extend the application of these technologies in other parts of the country.

3.5.2 Capacity development for research and development

A second short-term effort focused on strengthening the capacity of Haitian institutions for research and development (R&D). A proposal is now with the Ministry of Agriculture of Haiti to apply a set of institutional and local strengthening strategies to enhance the capacity of Haitian agricultural institutions and local farmer organizations to develop a robust R&D platform for agricultural innovation.

This initiative follows several meetings with the current Ministry of Agriculture, Dr. Phillippe Mathieu and a synthesis document prepared by the Group Thematique de Agriculture et Securité Alimentaire (GT-ASA) in June 2004. The GT-ASA was composed of some 22 members who met at the Montana Hotel in June 2004, with representatives of the Ministère de l'Agriculture et des Ressources Naturelles et du Développement Rural (MARNDR), Haitian agricultural institutions, the World Bank, the Inter-American Development Bank (IDB), FAO, and Spanish Cooperation.

Several activities, some very broad and some specific, were prioritized by the GT-ASA. Among them, the training of agricultural development agents in a variety of fields, creation of R&D regional centers to disseminate information, training of agricultural experts and leaders, promotion of agricultural enterprises, and creation and strengthening of professional organizations. Other activities refer to training MARNDR professional and technical staff, developing the physical plant for the Ministry, and implementing sector policies and strategies. Along the same lines, other priorities are the preparation of normative codes on water, farmers' organizations, agricultural credit, seed systems development, and other topics.

The interest of CIAT focuses around enhancing the capacity of Haitian institutions for R&D. The GT-ASA has expressed the priority as the "creation of R&D regional centers" for the various agro-ecological zones in the country. These centers, according to the GT-ASA, are to be linked to the agricultural systems present in each zone. It is expected that they will identify major production problems and their solutions through applied research activities adapted to the local context. The R&D centers will be organized on the bases of public institutions already existing (intermediate schools, research centers, etc.), and will be managed by multi-disciplinary teams of professionals with a sense of regional integration. An inventory of existing centers will allow identifying those that are better equipped. It is expected that a number of four to six centers will be adequate at the start.

Some existing structures may be used to establish such centers: the Middle Agriculture School at Dondon for hillsides agriculture, the Middle Agricultural School of Hinche, with emphasis on mechanization of agriculture, the Middle Agricultural School of the Artibonite Valley, for irrigated cultures, the Salagnac Center for small irrigation mountain systems and small farmer enterprises, and the Tuf Center in Jacmel, for fruit transformation.

3.5.3 Strengthening food security in Haiti

The Project "Strengthening food security in Haiti" is an initiative to which CARITAS-Haiti has made a commitment to jointly search for funds. It builds on previous CIAT research-for-development efforts and takes advantage of existing partnerships and institutional linkages. This project will be implemented in four departments: the South, Southeast, Center and North, and will extend over a 5-year period. These departments have been chosen to carry out this project based on the solid experiences of both CIAT and CARITAS in these regions of the country. The main objective is to strengthen food security within the areas of intervention, through yield and production increase, added value to agricultural goods, increased income for farmers, and building of local capacities on a sustainable basis.

The project will include two main components: (1) applied participatory research and (2) transfer of technologies generated in the target areas. Technology transfer (TT) will be linked closely to a subcomponent for on-farm seed production in order to attain a mass diffusion of planting materials on farmers' fields.

Participatory research activities will be concentrated in two departments that have the potential for replication of project results. Training, both for producers and for the project staff, will be a major component for the replication of activities, and for adaptation trials for the materials that have been selected within the other sites of the project; it will be geared so as to ensure the sustainability of the acquired results. Crops concerned by the project's activities are: beans, maize, sorghum, cassava, sweetpotato, and other roots and tubers, depending on existing opportunities within the project area.

A special emphasis will be placed on agricultural food processing technologies, mainly those for cassava, sweetpotato, etc. Seed systems also will be promoted in order to facilitate mass production of artisan seed for the crops that are included in research and extension activities in the areas of intervention.

The project will seek by all means to look for and encourage cooperation with the other institutions engaged in the agricultural sector, such as the Organism for the Rehabilitation of the Environment (ORE), FAO, and mainly the Ministry of Agriculture, primarily concerned with the extension of the technologies generated within the scope of activities of the project. Nevertheless, CIAT and CARITAS remain the two chief institutions in charge of its implementation.

3.6 The Rural Innovation Institute

C&W activities in support of the Rural Innovation Institute (RII) have concentrated in three areas: (1) support to a consultancy for the Kellogg Foundation, (2) support to the Fomentando Cambios (FoCAM) Project of the Investigación Participativa en Agricultura / Participatory Research in Agriculture (IPRA) in Bolivia, and (3) leading the Facilitating Innovative Technology (FIT) 8 Project for Bolivia on Pro-poor Knowledge Sharing Methods.

3.6.1 Support to the evaluation of Kellogg Foundation integrated projects

The integrated projects initiative (Conjuntos Integrados de Proyectos - CIPs) comes from a local participatory development framework and emphasizes youth protagonism and local social alliances. A CIP is a series of interventions that altogether provide an opportunity to reduce the "inter-generational poverty cycle" and reach a sustainable development process in a "micro-region", ensuring the participation of youth as key change agents, as explained by the W. K. Kellogg Foundation. This is achieved through a series of strategies, which promote youth development, participation, and leadership. It is also the result of cooperation among partners who, by means of articulated work, are able to come up with a wholesome response for development problems in a "micro-region".

The evaluation model used to evaluate CIPs focuses on social change and that of social actors who can promote it in a cooperative way, at the local level. Three lines of action provide meaning to the evaluation strategy: social mobilization, social articulation, and social learning.

The evaluation being conducted by Kellogg with CIAT's RII support is geared to formulate a series of hypotheses about "why" and "how" certain development events or processes, which in turn share certain premises or strategies, lead to successful results in the breaking of the "intergenerational poverty cycle". The information collected in the evaluation is then integrated to the CIPs internal evaluation processes.

In this evaluation effort, C&W has worked with a team convened by the RII in the design of the methodology to administer a series of evaluation instruments, and in providing support to their design and testing.

3.6.2 Support to FoCAM - Bolivia

The participatory monitoring and evaluation (PM&E) for rural innovation in Bolivia project, or FoCAM, promises to introduce PM&E methodologies into the Sistema Boliviano de Técnología Agropecuario (SIBTA) system in order to (a) increase the accountability of technical assistance providers, and (b) empower local farmer groups and rural communities to exercise greater control over development initiatives carried out by external agents.

FoCAM intends to contribute to establishing a pro-poor market of technical services that links them, within the SIBTA system, to agricultural innovation through the incorporation of action research methodologies. Reaching this goal will be expressed in terms of (a) strengthening the capacity of local farmer groups to demand technical assistance and research services, (b) the

development of methodological strategies that improve communication between the poor and the innovation service providers, and (c) strengthening SIBTA and the Foundations in terms of their institutional performance to appropriately link supply and demand sectors to facilitate access of the poor to technology generation and transfer.

One of the FoCAM project results is "the existence of research and technical assistance services providers committed to rendering their services to the poorest, and applying methodologies that ensure their participation in decision making regarding local agricultural innovation processes". A hypothesis in regard to this result is that "the technological innovation system led by SIBTA will be strengthened if those in the technological supply side are experts in the application and duly apply participatory methodologies, PM&E among others, which allow their clients to evaluate progress towards their agricultural development objectives and exercise the right to control and reorient innovation efforts".

This means that one of the key components of this project is capacity development. The project realizes that it is necessary to train, monitor, and provide process accompaniment to technical assistance providers in order for them to incorporate PM&E methods when executing their agricultural innovation projects (PITAs, the Spanish acronym) with farmer groups. On the other hand, it is also necessary to provide training and monitoring to groups of community-based agricultural development agents (*promotores*) who participate in rural community life and initiatives in order for them to establish PM&E processes with local stakeholders. The capacity development strategy then focuses on both operational levels, but includes the participation of Agricultural Development Foundations (FTDAs, the Spanish acronym), which are the administrative mechanism for rural innovation in Bolivia.

At this point, the capacity development process has made ample coverage in terms of people trained. Thirty-five PM&E practitioners are being trained to form a national team of facilitators, with the academic support of the San Simón University in Cochabamba. Seventeen stories of successful application of PM&E have been selected from among 23 prepared by practitioners of PM&E methods. A team of five Bolivian professionals supports this effort through this DFID-funded project.

3.6.3 FIT Project No.8: Pro-poor knowledge sharing methodologies

Bolivian SIBTA has yet to bring the poorest of the farming poor into the technological development process (PITAs). This project proposes to stimulate field-based evidence policy formulation. FTDAs and the División de Desarrollo Técnico (DDT) of the Ministerio de Asuntos Campesinos y Agropecuarios (MACA), technology service provider agencies with their technical teams, and some farmer leaders are key actors in improving the access of the poor to agricultural innovation. This project will be an opportunity to strengthen their capacities to systematize lesson learning for pro-poor policy formulation in SIBTA and partner TT providers, including local agricultural university programs. To this end, the project will participatorily identify a set of "knowledge-sharing methodological arrangements" useful to respond to the technological knowledge needs of farmers not yet benefiting from PITAs, but who demand the knowledge generated therein. Three methodological arrangements will be tested in 12 sites within the four agro-ecological regions corresponding to the four FDTAs, in terms of their

knowledge sharing potential. To derive understanding of principles and practices for rapid inclusion of the poor, the project will lead networking among the system's key actors. It is expected that interchange of methodologies, experiences, and lessons learned promote change towards the formulation of norms, vis-à-vis the oncoming promulgation of the SIBTA Law. Other project outcomes include the:

- Content analysis of PITA results in terms of their relevance to be included into the project's TT system;
- Organization of TT teams with leader-farmers and PITA service providers to apply and evaluate the methodological arrangements;
- Production of methodological guides to describe ways to apply these arrangements; and
- Presentation to SIBTA actors of the new knowledge sharing schemes to promote the establishment of systematic scaling out processes through FTDAs.

Progress report

FIT 8 officially started on 1 April 2004. During the period from 1 April to 30 June 2004, the project coordinator and his Bolivian counterpart, Eduardo Nogales, were dedicated to two different kinds of activities: (1) socializing the project among different stakeholder groups, and (2) organizing the "project platform". In both activities, face-to-face encounters were preferred to Internet dialog with most of the counterparts. This increased the number of trips to FTDA and service providers' headquarters.

The socialization of the project took place in a variety of fora that included:

- Project coordinator meetings with the four executive directors of the FTDAs;
- Two workshops to exchange ideas about the project with FIT project coordinators and other groups of stakeholders, convened by the Bolivian FIT Coordinator, Miguel Angel Pedregal;
- Several encounters with the DDT of the MACA and to the FIT Program Coordinator; and
- The Bolivian coordinator's visits to groups of technical assistance service providers that included negotiation of their participation. These included GAIA S.R.L., Adapicruz, Reingeniería Total, Agro XXI, UNEC Agro central and AGROCINTI S.R.L., all of which successfully executed PITAs in the four agro-ecoregions and who are willing to participate in the project.

The socialization process was a difficult task. Several stakeholders and some collaborators understood this project as "a quick way to replicate PITAs"; others thought that the project was to contribute its resources to Foundations so that they would be able to amplify successful PITAs to wider farmer audiences. Yet others were hesitant to collaborate, given their understanding that the project would provide mechanisms for farmers to access PITAs for free, etc. It was an interaction-intense task to help everyone understand that this project was interested in improving the quality of the methodological relationship between technical service providers and farmers, to improve the quality of learning and adoption. Foundations then would have better tools to reach larger audiences in a more efficient way, and could incorporate recommendations on the use of these tools by technical service providers, and new tools to monitor the results of PITAs.

The project platform was organized around the four FTDAs. There, technical personnel, financed by FIT 8 will carry out the PM&E of activities along with the technical assistance service providers of previously successful PITAs. Both the FTDAs and service provider institutions have agreed to host the project in terms of the use of their physical premises and other facilities. The Bolivian project coordinator will liaise with these people to keep track of and lead events. The general project coordinator will be working with the help of the Fundación Promoción e Investigación de Productos Andinos (PROINPA) in the conceptual and methodological guidelines of knowledge management. These will be inputs for the training of facilitators. Agreements have been reached to make payments to both the FTDAs and the technical assistance service providing agencies for their participation in the project. Nearly £40,000 sterling will be invested in the participation of partners and collaborators in this project.

It is important to note at this early stage of the project that charges for FTDA and technical assistance providers are higher compared to initial estimates. The same is true for the number of trips and initial investments made in setting up the institutional platform. This fact has made us reduce the budget for other activities such as workshops and publications. It is our hope that soon we will find additional funds that cover the tight budget we have presented in this first 6-monthly report.

Research process

At the end of this reporting period, all actors are in place and ready to initiate the learning process. Beneficiary farmers are expecting to start as soon as possible; nonetheless, in several of the methodological trials, we will have to wait for the planting season. Service providers expect the new methodologies to be field-tested to improve their work. Many non-participating service providers have asked for space in the training sessions so that they also can participate. The FTDAs have made all administrative decisions to hire a professional who is able to carry out the project PM&E at field level.

During August, a literature review was conducted to cover topics such as the training of facilitators, facilitation and leadership, participation, participatory action-research, poverty, farmer field schools, farmer-to-farmer methodology, agricultural knowledge and information systems, strategic extension, and other related topics.

The study that PROINPA will conduct (A Synthesis of Knowledge-Sharing Methodologies and a Proposal for New Methodological Arrangements) will provide us with an additional up-to-date review of literature in our area of interest: "Pro-poor RD&TT methods and methodologies".

FIT 8 as a research endeavor has been promoted also among the project's stakeholders. The leaders, found in the development environment, demonstrate their eagerness to reach efficient and quick solutions to agricultural innovation. When the project was described, one of these leaders suggested implementing the extension methodologies the project was expecting to evaluate in a particular macro region. This perception shows how important it is for development agents to use innovative ideas to improve their work, but at the same time lessens the appreciation for research as a critical tool for decision making in development processes.

Planned modifications to project implementation

The logical framework and the expected results continue to hold for FIT 8 as presented in its latest version (30 June 2004). Nevertheless, it is necessary to clarify that emphasis is placed on the development of knowledge-sharing approaches and how "knowledge facilitators" can master these approaches and use them in the field with farmers, applying the knowledge gained in previous successful PITAs, or in situations in which the PITA is in progress. The project intends to contribute to SIBTA with a set of methodological arrangements, their principles, and application strategies, so as to motivate decisions to include more efficient ways for knowledge sharing into the system.

3.7 Social Capital and Collective Water Management

This paper has been submitted to the Journal of Transdisciplinary Studies/ Institution of Development Studies Occasional Papers; see Westermann (2004), under 5.1.1. It is here formatted to fit in the Annual Report.

Background

Water is a natural resource that, due to gravity, transcends social and political boundaries such as farm or community boundaries, as well as municipal, departmental, or national limits. The transboundary nature of water creates a biophysical interdependency among different resource users (farmers, pastoralists, fishermen, urban settlers, etc.), and between different sectors (for agriculture, industry, drinking water, etc.) making it a field for ongoing struggle and collaboration efforts (Steins and Edwards, 1999; Ratna Reddy, 2000). Hitherto, the dominant focus in the study of collaboration and conflict in natural resource management has been on institutional arrangements and the conditions under which these are formed and maintained (see for example, Ostrom, 1990; Bromley et al., 1992, Leach et al., 1999). Only recently has attention been directed towards social and cultural features such as networks, trust, and reciprocity (Harris and Renzo, 1997; Lyon, 2000; Uphoff, 2000; Heisswolf, 2001; Pretty and Ward, 2001) broadly understood as social capital. However, most of these studies have assumed that social capital is something intrinsically positive without considering the social relations of power in which it is embedded.

Purpose and structure

Hence, the purpose of this paper is twofold: (1) to elaborate a framework of analysis for the study of social capital on the basis of power analysis, and (2) to inquire into how the biophysical characteristics of water shape the social organization of transboundary water management – explicitly systems of payments for environmental services (PES). The PES system is one of the most recent attempts to provide water users with institutional mechanisms for collective water management based on the increasing recognition of the environmental service that upstream managers (often poor rural farmers) provide to downstream users (often large-scale irrigation farmers and urban settlers). Environmental services related to water management include the protection of water quantity and quality, as well as prevention against landslides and flooding.

Resource characteristics and social organization

Based on the work of Oakerson (1992), Blomquist et al. (1994), and Agrawal (2002) this paper discusses some of the most important resource characteristics affecting collective action and institutions for common property and common pool resource management (Table 13).

Table 13. Some important resource characteristics affecting collective action and institutions for common property and common pool resource management.

Characteristic	Comment
Availability/scarcity:	The relative capacity of the resource base to support multiple users is not only a determining factor for where people settle in the first place and the size of the community it may support, but also important for whether people engage in collective management of the resource or whether conflicts occur. Relative abundance (for some or all) may not provide any incentive to engage in collective management of the resource, while scarcity may lead to a range of different outcomes dependent on the importance and distribution of the resource.
Accessibility:	Accessibility refers both to physical access to the resources, and to opportunities for meeting face to face to take decisions and coordinate actions. This, of course, is dependent also on the relative distribution of resource users (Ravnborg and Westermann, 2002).
Size and degree to which boundaries are defined:	The size of the resource and the extent to which boundaries are defined largely determine the success of other conditions of collective action, particularly whether users are capable of sustaining effective management institutions (Agrawal, 2002). Size, and the degree to which the boundaries of the resource is defined, determine the possibility to exclude or limit access for individuals or groups of users, as well as the possibility to implement and monitor rules and enforce sanctions (Wade, 1987; Ostrom 1990; Oakerson, 1992; Balland and Platteau, 1996, p. 287; Agrawal, 2002).
Mobility and risks:	All natural resources are mobile to some, but not the same, degree. The mobility of the resource largely determines the need for collaboration as well as the risk of conflict. Water is almost always a resource shared by many different users with different needs and interests, and the use of water at one point in time and space will most often affect the availability of the same water resource for other users at another point in space and time. Hence, water's high degree of mobility determines the need for organizational and collective management. Related to mobility is the volatility and unpredictability of resource flow, and the risks associated with these (Agrawal, 2002, p. 53).

The transboundary nature of water and the biophysical and social interdependencies it creates among a range of different users are fundamental principles that make payment for environmental services feasible. However, the same mobility of the resource and the difficulties related to the management of this common pool resource also creates the greatest challenge for the establishment of institutional mechanisms and social organization of payment for environmental service.

The institutional frameworks for PES need to be based on diverging stakeholder interests and power relations, which involves collective action and conflict resolution. Social capital is central to these processes of organizing and negotiation because:

- Communities need social organization and external links to be able to influence the rules of PES and to secure or expand their access, use, and control over natural resources;

- Communities need internal organization to establish and comply with rules and settle disputes, including issues of internal distribution; and
- Social capital, in terms of linking networks and trust, serves as a bridge for building larger management units with multiple stakeholders.

Social capital and power

However, to understand the dynamics of social capital and how it is used and reproduced in these settings, we need to understand better the social processes in which it is embedded, most notably in relation to power and inequality (Harris and Renzo, 1997; Fine, 1999; Molyneux, 2002).

First, it may be argued that all social interaction, even when the objective is mutual, beneficial, collective action to which social capital arguably is so important, takes place in a given set of power relations and often involves power struggles over diverging interest. This discussion touches upon a fundamental difference between two of the most influential writers on social capital, Putnam (see Putnam et al., 1993) and Bourdieu (1986). Using Bourdieu's understanding of social capital as a resource that is exploited by individuals in a continued struggle with other individuals or between different fields of society, this paper argues that it is insufficient to analyze social capital as generalized trust and consensus of social values without taking into account the different interests and conflicts among stakeholders in a society. However, collaboration cannot be understood purely as a struggle to pursue individual interest, nor should we reject the existence of unselfish/altruistic behavior and trust among individuals (features with which Bourdieu does not work).

The framework developed for this paper is inspired by the work done by Paulsen and Funder (1997) on power, decentralization and access to natural resources in Zimbabwe. Following Giddens (1984, p. 14), they define power as the transformative capacity of individuals to "...intervene in the world, or to refrain from such intervention, with the effect of influencing a specific process or state of affairs" which puts the analytical focus on the resources that actors hold, and on the action and interaction among actors as they bring these resources into play. This conceptualization of power is useful for understanding the dynamic aspects of social capital, because social capital is embedded in power relations, and because social capital, in line with Bourdieu, may be understood as one of several important resources that constitute the power that an actor holds.

The interesting point about Bourdieu's conceptualization is the dynamic understanding of power as something that can be accumulated and exchanged. This definition is similar to the conception of social capital as invested relationships – understood as the ability of actors to create social capital (Uphoff, 2000). Both ideas emphasize the action of actors to access and employ capital resources. In relation to this, Bourdieu operates with the notion of "fields" understood as any area of society within which actors may have an interest. The relations of power among actors structure the field—and the positions individual or groups of actors hold within this field is determined by the capital or resources they hold. In order to increase their influence on how the content and boundaries of a field is defined—in other words, to pursue particular interests—actors seek and apply the relevant forms of capital important to that field. Drawing on Bourdieu's notion of field, Nuijten (1998) operates with the concept of force fields, which she

defines as "...a field of power and struggle between different social actors around which certain forms of dominance, contention and resistance may develop, as well as certain regularities and forms of ordering". Hence, she concludes that the patterning of organizing practices is not the result of common understanding or normative agreement, but of the forces at play within that field. She suggests analyzing force fields through the study of interaction and individual strategic power games, and particularly the flow of action linked to these. Basically, she suggests that we ask simple questions such as what is going on, why is it going on, who engages in it, with whom, when, and how often?

These ideas on the relationship between social capital and power form the basis for the framework of analysis for the study of social capital and transboundary water management elaborated in this paper. Hence, water management, with emphasis on the environmental service it provides, becomes the field to be studied; the actors with interests in this field become the stakeholders to work with; and their relations of power, particularly the social capital aspects of power, becomes a measure of the ability for actors to coordinate water management. What we want to explore then is the physical characteristics of water, the nature of social capital in the selected research sites, the social capital resources that actors hold in relation to each other, and finally how actors acquire, reproduce, and not the least employ social capital in situations of collaboration and conflict.

Working questions for the framework

What is the nature of water management as a field? First, we need to explore water management as a field, starting with the biophysical characteristics of water management, particularly flow and externalities, volume, and use. Specific attention should be paid to the environment service that water provides to different users not only within communities and watershed boundaries, but also in the areas of influence in the valleys in terms of water availability and quality as well as validation of risks of flooding and landslides.

The next step will be to get an overall impression of how water management is organized, that is, what formal and informal collective action takes place, and what struggles/conflicts go on outside and within these more or less formalized structures of organization. Included in this analysis should be a first assessment of who are the actors or stakeholders, as well as an initial understanding of what capitals are at stake. Such an analysis should include a more thorough historical review of water use, users, institutions, access, organization, and struggle because water management often is embedded in the historical structures of organization and the gradual process of transformation that has occurred to these.

What are the power-bases of the various actors (institutions and users) involved in water management? Having defined the content and boundaries of the field of water management, we should have a closer look at the stakeholders and their power bases within this field—particularly social capital. Stakeholders are grouped according to use of and access to water, for example, use of water for household purposes, irrigation farmers, urban settlers, industry, etc. In addition to this, Paulsen and Funder (1997) operate with what they call "institutional actors" that may be defined as the institutional settings where laws and rules over access and control are developed and transformed. Such institutional actors include central and local government actors, NGOs

and community organizations, as well as customary institutions. All of these may be regarded as actors in their own right, but also as an arena for struggle between actors. It is important to look at the constitutive and regulative rules these institutional actors set, and with them the existing institutionalized patterns of behavior for water management. In particular, we need to understand what capital backs these rules and what specific actors occupy what positions of control within them. The next phase in this sort of stakeholder analysis is to explore the interests of the institutional and user actors, the resources or capital available to them, and finally how they relate to each other.

How do actors acquire, reproduce and employ social capital in situations of collaboration and conflict over water management? In order to understand the dynamics of collective action beyond the "official" formal institutions and structures of organization, and to capture the multiple, informal, and changing ways the poor organize themselves in relation to water management, this framework applies the notion of organizing practices and the search for "the history of the hidden". To do so, it is necessary to look for important events or situations of collective action and conflict, and inquire into how they have unfolded. According to Nuijten (1998), examining contention, struggle, and conflict around resources is particularly useful because they give insight into the central issues at stake, and the power struggles and practices that develop around them. In fact, she argues that the study of conflict may reveal how people organize themselves – or not. Unfolding situations and areas of controversy and struggle in the processes of social organization will disclose a great deal more about how and why people succeed or fail to build collective action than simply studying structures, rules, and norms. Within this analysis it will be important to understand who the stakeholders are and how they interact, as well as what capital is at stake and, for example, what discourse is used. Finally, we need to look at the outcomes of these continued processes of negotiation and struggle in relation to the interests of the stakeholders.

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4. Workshops / Training

4.1 GIS in the Youth Project

The use of GIS as a support tool in the Youth Project appears as a transverse support (in complement to participation, research, and alliance) to achieve the project objectives.

In the integral formation of youth, it contributes cutting-edge technological elements such as remote sensing images, GPS, programs for data processing and analysis, and generation of information.

In food security issues, it locates and monitors the evolution of proposed technologies (agricultural and for use with livestock) for the increase of food supply available to local actors, contributing elements of judgment to target intervention.

In sustainability, territorial impact has been monitored using GIS in:

- The process of bamboo transformation (guidance in the convoking of linked actors, locating meeting nuclei for training, locating transformation sites);
- Integrating with the conservation and recuperation of bamboo and its relation with other environmental services (inventory and characterization of bamboo groves and areas with potential for their growth); and as

- Complement to other compatible species for ecological restoration in the framework of the sustainable use of natural resources through participative research with young actors (integration of the sociocultural with the environmental aspect).

At present, the experience is in a process of systematization with the aim of contributing to the elaboration of a model of participative research with young communities, repeatable in similar contexts. In this sense, elements such as the work in alliance with local and regional institutional actors, a permanent presence in the work zone, correct selection of the target group (young population), and constant participation in the process, begin to take shape as linking strategies with those needed to guarantee success in similar projects.

With the aim of strengthening the contribution to the integral formation of youth, a temporary station has been implemented for analysis using GIS in the municipal Mayor's Office of El Dovio, in alliance with the municipal administration. The aim of this station is focused on:

(1) Data registration and generation of geo-referenced information in the zone of intervention.
(2) Teaching role of the tool, seeking to offer elements that contribute in the integral formation of young leaders.

Both aspects are complementary since the registration, systematization, analysis, and generation of information are completed by youth and other participating actors in coordination with GIS and C&W technicians.

Results obtained offer support to the administrative management of the municipal Mayor's Office, which strengthens the relation of the strategic alliance and youth education. The supply of necessary data helps direct the project's immediate intervention and the initiatives that are generated from this to guarantee a better quality of life for local actors, supported with adequate research in harmony with other life forms.

4.2 CATIE

As early as January 2002, CIAT and CATIE had established a shared project to work on the social effects that alternative natural resource management strategies or decisions have in watersheds and on the multiple stakeholders involved in decision making. The initial agreement was renewed from April 2004 to December 2005.

The strategy followed this time around was to establish a joint position between both institutions. By April 2004, Mario Piedra joined CATIE's staff and was stationed in Turrialba with financial support from C&W. The reported actions are part of a series activities carried out by him in accordance to the terms of reference (TORs) of the agreement.

4.2.1 Courses at graduate level

Title: Ecological and socioeconomic considerations for a sustainable agricultural production and management of natural resources (Jan-Feb).

The target group for this course is students from M.Sc. programs in Ecological Agriculture, Watershed Management, Tropical Forests and Biodiversity, and Tropical Agroforestry. The purpose was to identify and explain basic concepts taken from ecological social and economic sciences relevant to the challenge of finding sustainable development strategies in tropical rural areas reconciling socioeconomic development with the preservation of native biodiversity, and its values and functions. In 2004, 51 students took the course, achieving a mean grade of 8.6.

Title: Rural economics
The target group for this course is students from MSc programs in Environmental Economics at CATIE. This is a classic course in Production Economics at the intermediate level, offered in Agricultural Economics and Natural Resources. The objective of the course is that students may be able to understand and conceptualize, from an economic perspective, production processes of goods and services (including the environment) of the tropical ecosystems. In 2004, five students took the course, achieving a mean grade of 9.

Title: Quantitative methods for socio-economists (March-April)
The target group for this course is students from M.Sc. programs in Environmental Economics at CATIE. This is a course presenting a set of quantitative tools for socioeconomic analysis at the graduate level. Linear and probabilistic models were covered, and how to apply them to the production processes of goods and services (including the environment) of the tropical ecosystems. In 2004, 10 students took the course, achieving a mean grade of 7.7.

4.2.2 Training courses

Lectures at the First International Training Course on Environmental Economics and Valuation of Goods and Environmental Services, 20/09 –01/10/04:

(a) The importance of property rights on environmental economics and valuation of goods and environmental services.
(b) Multi-functionality of agriculture.
(c) Economic considerations valuing biodiversity.

Lecture given on "The importance of shifting from financial to economics analysis while drafting forestry and environmental projects" at CATIE's training course on Identification, Formulation and Financial/Economic Evaluation of Forestry and Environmental Projects, 07-18/10/04.

4.2.3 Research activities through M.Sc. theses supported by C&W

Thesis already in the final stage of completion

Raffael Vignola and Mario Piedra, "Metodología de indicadores de vulnerabilidad socio-ambiental para la priorización y monitoreo del sector agua para consumo humano en la sub-cuencas del Rió Acelhuate, El Salvador." The main objective of this work is to strengthen prioritization capacities of interventions around water resources for human consumption in the Alcelhuate River Watershed. The specific objectives are to:

- Establish a relationship between increments in the morbidity rates and water availability according to the type of water provision in the households (well, spring, etc.);
- Establish a cause-effect relationship between socioeconomic variables and morbidity rates according to water source types in households;
- Validate as indicators the socioeconomic variables selected in the specific objective above;
- Establish economic health costs related to water pollution for human consumption; and
- Support the creation of a GIS database to store and analyze the variables related to water resources for human consumption.

So far, all fieldwork in El Salvador has been completed and the student is working on data analysis and modeling at CATIE. A final thesis report is expected by December 2004.

Thesis proposals still under discussion and expected to be in their final form by December 2004 and finalized by December 2005:

(1) Katherine Tehelen, Francisco Alpizar, Mario Piedra, Ignacio Sanz, "Environmental and economic valuation of the use and management of water resources in the upper watershed of the Barbas River (Valoración económica y ambiental del uso y manejo del agua en la cuenca alta del Río Barbas)". The main objective is to estimate the opportunity costs of water uses in the upper watershed of the Barbas River, and to design a proposal for an environmentally adjusted tariff to internalize the costs of water source protection. The proposed objectives are to:

- Identify the impact of social, economic, political, and technical changes in water demand in the upper watershed of the Barbas River;
- Estimate water consumption for domestic, agricultural, and industrial uses in the upper watershed of the Barbas River;
- Estimate the cost of providing water internalizing opportunity, and operational and maintenance costs of the current distribution system; and
- Ascertain the true cost per cubic meter of water to estimate a tariff structure for the optimal use of the resource.

Fieldwork will be developed in the Barbas River Watershed, in Cali, Colombia, during 2005.

(2) Maria Eugenia Baltodano, Francisco Alpizar, Mario Piedra, and Ignacio Sanz—final topic still under discussion. M.Sc. thesis will be developed in collaboration with the Fortalecimiento de la capacidad local en manejo de cuencas y prevención de desastres naturales (FOCUENCAS) II project in Nicaragua. Fieldwork will be developed in the Calico and Jucuapa watersheds in Matagalpa, Nicaragua. The theme to be addressed will be Environmental Services.

4.4 Toolbook, Nicaragua

Within result 1 of the project "Facing the challenges of the millennium", which is being carried out in alliance by the institutions INTA, UNA, CARE, and CIAT, the second activity was the Training Workshop on the Management of the Software, Toolbook. This is a computer program that will serve for the interactive systematization of the information collected on the base of a group of measurable indicators for the selected themes in integrated watershed management

(cultural, biophysical, socioeconomic, soil, water and biodiversity, land use-production systems, and community management aspects). The workshop took place from the 13-17 of April 2004 at UNAN-Matagalpa.

Objective

To support the systematization of the information of the set of local indicators through training and consultancy in the software, Toolbook, to structure the base line with the focus of integrated watershed management in the rivers Calico (San Dionisio – Matagalpa) and Viejo (La Concordia, San Rabel del Norte, and San Sebastián de Yalí).

Methodology

The scheme followed consisted of: (a) explanation and installation of the software by the participants in their computers; (b) explanation of the functions of the basic icons of the work of the software toolbars, work with graphics, maps, and different images; (c) explanation of how to give functionality to the objects in Toolbook through written orders (called Scripts); (d) carrying out the exercise of how to close the CD (create the installer); (e) each day after each explanation the carrying out of individual exercises by the workshop participants and questions answered; (f) explanation to the group on the definition of the work areas; (g) explanation on the predetermined template that will be used to systematize the information of each work area; (h) work with the existing information in the menus and submenus for work on the base of the indicators previously selected.

Results

- UNAN-Matagalpa: 36 officials of the institutions in the alliance and local partners trained in the use of the software, Toolbook (22 from INTA, three from UNA, two from CARE, three from CIAT, three from the municipalities [Mayors' Offices] of La Concordia, San Rafael del Norte, and San Dionisio, and three research staff of the university).
- Toolbook template previously prepared to begin the work of systematization of the information based on the selected indicators submitted.
- Report on the training given to the members of the alliance and local partners in the methodology of the base line (Toolbook) prepared.

5. Publications / Communications

5.1 Refereed Journals

Brown, S. 2004. Spatial analysis of socio-economic issues: gender and geographic information systems in Nepal. Mount. Res. Dev. 23(4):28-34.

Brown, S.; Kennedy, G. 2004. A case study of cash cropping in Nepal: poverty alleviation or inequity? Agric. Human Values. In press.

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Schreier, H.; Brown, S. 2004. Multiscale approaches to watershed management: land-use impacts on nutrient and sediment dynamics. *In*: Tchiguirinskaia, I.; Bonell, M.; Hubert, P. (eds.). Scales in hydrology and water management (Echelles en hydrologie et gestion de l'eau.) International Association of Hydrological Sciences (IAHS) publ. 287, Wallingford, GB. p. 61-71.

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5.2 Chapters in Books

Beltrán, J. A.; Orozco, P. P.; Zapata, V.; Sanz, J. I.; Roa, M. C.; Schmidt, A. 2004. Scaling up and scaling out – The importance of watershed management organizations. *In*: Pachico, D.; Fujisaka, S. (eds.). Scaling up and out: achieving widespread impact through agricultural research. Centro Internacional de Agricultura Tropical (CIAT), Cali, CO. p. 153-173.

Guimaraes, E. P. Sanz, J. I.; Rao, I.; Amézquita, M. C.; Amézquita, E.; Thomas, R. J. (eds.). 2004. Agropastoral systems for the savannas of Latin America. CIAT - Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), Cali, CO.

Schreier, H.; Brown, S. 2003. Methods used to address resource issues in integrated watershed management in Nepalese watersheds. Case study 18. *In*: Pound, B.; Snapp, S.; McDougall, C.; Braun, A. (eds.). Managing natural resources for sustainable livelihoods: uniting science and participation. Earthscan Publications, London, GB. p. 231-234.

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5.3 Workshop and Conference Papers

Brown, S. 2003. Women, water and workloads, Nepal. Banff Mountain Summit, 2003: Mountains as Water Towers. International Year of Fresh Water. 23-26 November 2003, Centro Internacional de Agricultura Tropical (CIAT), Comunidades y cuencas, marco conceptual. Presentado por Beltrán, J.A. al Foro Centroamericano de Cuencas Hidrográficas, noviembre del 2003, Managua, NI.

Brown, S. 2004. Involving communities in natural resource management: international experiences. Institute for Resources, Environment and Sustainability, 16 February 2004, Vancouver, CA.

Brown, S. 2004. What's drip irrigation got to do with drip irrigation anyhow? Water and development issues in Nepal. Bridging the Gap. Engineers Without Borders, 13 March 2004, Vancouver, CA.

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Phengsavanh, P.; Fahrney, K.; Phimphachanhvongsod, V.; Varney, G. 2004. Livestock intensification: forage and livestock technologies for complex upland systems. Paper presented at the workshop on Poverty Reduction and Shifting Cultivation Stabilization in the Uplands of the Lao PDR, 27-30 January 2004,Luang Prabang, LA.

5.4 Technical Reports and Others

Baltodano, M. E.; Bosco, J. (eds.). 2004. Curso taller sobre metodología de línea base con indicadores medibles para el manejo integral de cuencas. Instituto Nacional de Tecnología Agropecuária (INTA), Universidad Nacional Agraria (UNA), CARE International, Centro Internacional de Agricultura Tropical (CIAT), Matagalpa, NI. 27 p.

Brown, S.; Roa, M. C.; Schreier, H. 2004. Áreas de sensibilidad ambiental y social / Environmental area assessment: methodology, version 1.1. Communities and Watersheds, CIAT jointly with Institute for Resources and Environment, UBC, CA. 1 CD-ROM.

Burgos, P. L.; Mendoza, F.; Bosco, J. (eds.). 2004. Curso taller sobre sistemas de información geográfica. Instituto Nacional de Tecnología Agropecuária (INTA), Universidad Nacional Agraria (UNA), CARE International, Centro Internacional de Agricultura Tropical (CIAT), Matagalpa, NI. 29 p.

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Escober, V.; Bosco, J. (eds.). 2004. Curso taller sobre manejo del Toolbook para sistematizar información de línea base con indicadores medibles para el manejo integral de cuencas. Matagalpa. Instituto Nacional de Tecnología Agropecuária (INTA), Universidad Nacional Agraria (UNA), CARE International, Centro Internacional de Agricultura Tropical (CIAT), Matagalpa, NI. 20 p.

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6. Proposals

Watershed management with young researchers in the Tascalapa River subwatershed, Yorito, Yoro-Honduras

This project aims to: (a) Strengthen the capacity of young researchers in the management of water harvesting, linked to drip irrigation in bio-intensive gardens; (b) establish local capacity in groups of young people to analyze the quality of potable water (monitoring of fecal coliforms and constructed wetlands); (c) strengthen leadership capacity (abilities in communication, work in teams and self-esteem, computing and data analysis); and (d) contribute to a better education of youth based on local and current demands with the vision of the watershed as an integral project of development. This proposal was submitted to the SDC at the request of the Assistant Resident Director of Honduras, after a visit to the region. The amount requested is US$30,000.

"The community self-organizes for research" in natural resource management with emphasis on integrated watershed management

The proposal of this project is to increase capacity of the communities in the realization of their own "research and development" and undertake technical changes in forestry and agricultural production that lead to greater productivity and income and less environmental deterioration in the six subwatersheds of the Programa Socioambiental y de Desarrollo Forestal (POSAF) of the Ministerio del Ambiente y Recursos Naturales (MARENA). This project will be carried out jointly between C&W and IPRA. The amount requested is US$100,000.

Repartir lo que se puede medir: gobernabilidad en el manejo del agua
(Share what can be measured: governability in water management)

Submitted by ASOBOLO in partnership with C&W CIAT to the Governance program of the Canadian Embassy in Bogotá. The specific objectives of the project were to improve the sustainable management of water resources in the area of the Bolo River, to strengthen civil society organizations to participate in the design of water policy, and to conserve water resources in light of changing water laws in Colombia. Location: Bolo River, Cauca Valley, Colombia. Budget: $40,000 Canadian. Duration: 18 months. Status: denied, as the focus on water governance did not fit within the Canadian governance framework, which focuses on political participation.

Evaluación de la influencia del bosque ripario de Guadua (*Guadua angustifolia*), en la conservación de la calidad del agua en la cuenca media del Rio Garrapatas
(Evaluation of the influence of bamboo riparian forest [*Guadua angustifolia*] in the conservation of water quality in the middle watershed of the Garrapatas River)

Submitted to the CIAT Internal Fund for national staff researchers under 30 by Sandra Dossman and Lina Garcia. The objective of the research is to evaluate the influence of riparian *guadua* (bamboo) forests and their management on water quality, specifically: (a) working with local youth, to determine physical, chemical, and biological indicators in relation to *guadua* management and harvesting; (b) developing a learning model for youth to replicate the information elsewhere in the region. Location: Garrapatas Canyon, El Dovio, Colombia. Budget US$2000. Duration: 1 year. Status: successful.

Water quality and health: beyond diagnosis. A case study in Quebrada Grande, Colombia

Submitted to the CIAT strategic research fund. The goal of this proposed study is to investigate the effectiveness of constructed wetlands for contaminant filtration. Specifically it aims to: determine bacteria (coliforms), sediments and nutrients (N and P) loadings in relation to land use; construct and monitor wetlands, and the effectiveness of native species in nutrient removal; and to evaluate the "safety" of local drinking water supplies with respect to human health. Location: Los Sainos watershed, El Dovio, Colombia. Budget: US$10,000. Duration: 1 year. Status: unknown.

Innovation in water management: allocation, green water, and demand control in the Andes

Submitted under the pilot project on Agricultural, Research Fondo Regional de Tecnología Agropecuária (FONTAGRO) / IDB / CGIAR. A joint proposal with CGIAB-Bolivia, Grupo Randi Randi Ecuador, C&W-CIAT, and the UBC. The proposed project seeks to improve water resource management in upland rural communities of the Andes through sustainable agricultural practices and the sound management of natural resources. Specifically it aims to: quantify water availability seasonally; determine the contribution and importance of green water; quantify the impacts of land management; document current water use, allocation, and equity; combine hydrometric, water quality, water rights, water use / access data at the community / watershed scale; and initiate actions in partnership with local stakeholders for improved green water management, demand control (soft path), and allocation. Location: Barbas River-Colombia, Tiqupaya-Bolivia, and El Angel-Ecuador. Budget: US$495,000. Duration: 3 years. Status: unsuccessful.

Investigación y acciones para el mejoramiento de la disponibilidad de agua en la cuenca del rio Bolo
(Investigation and activities for the improvement of water availability in the Bolo River watershed)

Joint C&W – ASOBOLO submission to the Japan Embassy. The project goal is to improve living conditions for the rural communities in the Bolo River watershed through improved water access and water quality. Specifically, the project aims to involve local youth in water quantity

and quality monitoring, and local initiatives to improve water quality; to create local capacity with ASOBOLO. At the community level, it aims to analyze issues related to water quality and variation in stream flow, and to implement systems to improve water quality and water use efficiency. Budget: US$50,000. Duration: 18 months. Status: in process.

Desarrollo de alternativas tecnológicas y capacidades locales de jóvenes y mujeres en busca de la seguridad alimentaria
(Development of local alternative technologies and capacities of youth and women in search of food security)

Submitted to the McKnight Foundation in association with CGIAB-Bolivia. The project objective is to contribute to local capacity building of indigenous youth and women in solving food security issues in the Bolivian Andes, specifically focusing on bio-intensive vegetable gardens in combination with low water use technologies, nutrition, and potential income generation. Location: Tiquapaya Bolivia. Budget: US$150,000. Duration: 3 years. Status: unsuccessful.

Youth and green water research: Colombia-Canada International Network

Submitted to the Re-Source Award 2004 sponsored by the Swiss Re-Insurance Corporation, by C&W in cooperation with UBC. The proposed project seeks to improve the management of green-water and to initiate the soft path approach to water demand management in two comparative watersheds in Colombia and Canada. Specifically, it aims to: improve water management based on quantification of the resource; effective water management policy in relation to conservation and/or restoration; enable more efficient allocation of water based on a balance of water availability, quality, and need; develop intervention projects for improving water availability and quality through soft path approaches; and mentoring to build youth capacity for the future. Location: Salmon River-Canada and Barbas River-Colombia. Budget: US$100,000. Duration: 1 year. Status: submitted.

Scaling water use, quality, and equitable water distribution issues in the Andes

Submitted to IFAD under the WFCP. The project goal is improved capacity for the management of water at multiple scales. Specifically, it aims to: create capacity for research and improved management at various scales through networking and sharing of research results; identify comparable indicators at different scales; contrast trade-offs between water availability, use, and allocation; and document methods, tools, applications, and success stories that operate across scales. Location: Bolo River-Colombia, Barbas River-Colombia, El Angel-Ecuador, and Tiquipaya-Bolivia. Budget: US$850,000. Duration: 3 years. Status: unsuccessful – new donor being sought under the umbrella of the WFCP. Remains no. 2 in the WFCP funding queue.

Feria Jóvenes, desarrollo y paz: "la guadua, alternativa económica y cultural para la comunidad joven de la cuenca media del río Garrapatas, Serranía de los Paraguas – Colombia"
(Youth Festival, development and peace: "bamboo, economic and cultural alternative for the young community in the middle watershed of the Garrapatas River, Serranía de los Paraguas, Colombia)

Festival of development with the Colombian government in the Plan Colombia Joven (Colombian Youth Plan). This call was directed at youth groups that will develop projects to improve living standards and generate income and development opportunities. The aim is to implement the manufacture of bamboo handicrafts as a business activity representative of the Garrapatas River Canyon that makes possible the generation of employment and income for the young community that lives in these zones, and create a research model that can be adapted and applied in other areas of Colombia, keeping in mind that the population of this reference site is vulnerable to displacement because of the problem of public order and confrontation with armed groups. Submitted to: World Bank Initiative in Colombia. Budget: Col. pesos 63,000,000. Status: unsuccessful.

Creation of Community Centers of Higher Education - connectivity

This was in reply to the Ministry of Education's call for the co-financing of Centros Comunitarios de Educación Superior (CCES). To respond to the need for connectivity in the municipality of El Dovio, objective of the Youth Project, and generate new opportunities of education, communication, and technology, a Regional Alliance was formed that will respond to requests of the call. In the Alliance are: the SENA, INTEP, CIAT, El Dovio's Mayor's Office, Asociación de Productores de Panela (ASOPANELA), and the Grupo Asociativo de Artesanos en Guadua. Budget: Col. Pesos 100,000. Duration: 3 years. Status: in progress.

7. Investigators

Colombia:

José Ignacio Sanz	PhD Soil Science, Project Manager
Vicente Zapata	EdD Adult Education, Institutional Capacity Building
Sandra Dossman	BSc Graphic Designer, Communications Assistant
Adriana Domínguez	BSc Finances, Administrative Assistant
Sandra Brown (50%)	PhD Resource Management, , Senior Staff, UBC-CIAT Alliance
Lina A. García	MSc Watershed Management
Andrea Carvajal (50%)	BSc Journalist, Documentation Center (left during 2004)
Gregoire Leclerc	PhD Physics, Consultant, Book Editing
Pedro Lorenzo Burgos	BSc Agronomic Engineer, Research Assistant
Wilson Celemin	Officer
Gustavo A. Duque	Worker
Luis Enrique Echeverri	Worker
Adriana Giraldo	Part-time Worker
Julián Giraldo	Part-time Worker

CIAT – CONDESAN in Colombia

Rubén Darío Estrada	MSc Economist, Leader Policy Analysis
Ernesto Girón	BSc Topographic Engineer, Research Expert
Ximena Pernett	BSc Agriculture Engineer, Research Assistant

Costa Rica:	
Mario Piedra (25%)	PhD Agricultural Economics, Senior Staff, CATIE-CIAT Alliance
Honduras:	
Guillermo Giraldo	MSc Agronomy, Consultant, Seed Systems
Vilia Escober (50%)	BSc Journalist, Administrative Assistant
Gilman Palma	Technician, Production Systems, Field Assistant
Rosalio Mencía	Para-technician, Field Assistant, Yorito
Juan Evangelista	BSc Forestry Engineer, Research Assistant
Justa Mérida Barahona	High School Ecology and Environment, Local Coordinator Youth Project
Nicaragua:	
Jorge Alonso Beltrán	MSc Agronomy, Liaison Officer
Juan Bosco Franco	BSc Agronomic Engineer, Research Assistant
Pedro Pablo Orozco	BSc Agronomic Engineer, Production Systems, Research Assistant
Elvis Cayetano Chavarria	Field Assistant, San Dionisio

Haiti:

Gardy Fleurantin	MSc Agronomy, Liaison Officer

Southeast Asia:

Rod Lefroy	PhD Soil Science, Regional Coordinator of CIAT in Asia
Keith Fahrney	PhD Agronomy and Soil Science PRDU Project Director
Lao Thao	BSc Crop Protection, PRDU Project Assistant (Lao PDR)
Duong Van Son	PhD Agronomy, PRDU Project Assistant (Viet Nam

Students:

Colombia:

María Cecilia Roa, PhD studies, Wetlands Hydrology UBC (Canada)
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Katherine Tehelen, MSc in Environmental Socio-economics, CATIE (Costa Rica)
Gracia María Lanza, MSc in Environmental Sciences, Wageningen University (Holland)
Alina Estrada, Student internship Graphic Designer, Universidad Autónoma (Colombia)

Nicaragua

María Eugenia Baltodano MSc in Environmental Socio-economics, CATIE (Costa Rica)
Valerie Piccand, Student internship, Water Quality Indicators, Swiss College of Agriculture (SCA)
Suzanne Zanelli, Student internship Natural Resources, Universidad de La Paz (Costa Rica)

8. Acronyms and Abbreviations Used in the Text

Acronyms

ACDI	Agricultural Cooperative Development International
ACERG	Asociación de Centros Educativos del Cañon del Río Garrapatas, Colombia
ACTUAR	a local NGO, Colombia
ADB	Asian Development Bank
APS	Asociación para la Participación al Desarrollo, Honduras
ARC	Agricultural Research Centre, Lao PDR
ASOBOLO	Asociación de Usuarios del Río Bolo, Colombia
ASOPANELA	Asociación de Productores de Panela, Colombia
AusAID	Australian Agency for International Development
BMP	Best Management Practices
BMWP	Biological Monitoring Working Party score system of water quality
BOD	Biochemical Oxygen Demand
C&W	Communities and Watersheds Project
CARITAS	an organization of the Roman Catholic Church
CATAS	Chinese Academy of Tropical Agricultural Science
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza, Costa Rica
CCD	Comisión Cristiana de Desarrollo, Honduras
CCES	Centros Comunitarios de Educación Superior
CDM	Comité de Desarrollo Municipal, Nicaragua
CGIAR	Consultative Group on International Agricultural Research
CGIAB	Comité Gestión Integral del Agua en Bolivia
CIAL	Comité de Investigación Agrícola Local
CIDA	Canadian International Development Agency

CIGMAT	Centro de Información Geográfico del subcuenca del Rio Grande de Matagalpa, Nicaragua
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo, Mexico
CIP	Centro Internacional de la Papa, Peru
CIPs	Conjuntos Integrados de Proyectos
CIPAV	Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuária, Colombia
CISP	Comité Internacional para el Desarrollo de los Pueblos, Honduras
CLODEST	Comité Local para el Desarrollo Sostenible de la Cuenca del rio Tascalapa, Honduras
COD	Chemical Oxygen Demand
CONDESAN	Consorcio para el Desarrollo Sostenible de la Ecorregión Andina
CONSULUPE	Consultores Luchando Profesionalmente con Experiencía, Honduras
CORPOVERSALLES	Corporación para el Desarrollo del Municipio de Versalles, Colombia
CP	Challenge Program
CRQ	Corporación Autónoma Regional del Quindío, Colombia
CVC	Corporación autónoma regional del Valle del Cauca, Colombia
DAI	Development Alternative Inc.
DDT	División de Desarrollo Técnico, Bolivia
DFID	Department for International Development, UK
DICTA	Dirección de Investigación de Ciencias y Tecnología Agrícola, Honduras
DOST	Department of Science and Technology, Viet Nam
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária, Brazil
ESNACIFOR	Escuela Nacional de Ciencias Forestales, Honduras
FAO	Food and Agriculture Organization of the United Nations
FCRC	Food Crops Research Center, Viet Nam
FINAGRO	Fondo de Garantías Agropecuarias of the Banco Cafetero, Colombia
FIPAH	Fundación para la Investigación Participativa con Agricultores, Honduras
FIT	Facilitating Innovative Technology projects, Bolivia
FLSP	Forages and Livestock Systems Project
FoCAM	Fomentando Cambios Project, Bolivia
FOCUENCAS	Fortalecimiento de la capacidad local en manejo de cuencas y prevención de desastres naturales, CATIE project
FONTAGRO	Fondo Regional de Tecnología Agropecuária
FRC	Forest Research Center, Lao PDR
FTDA	Fundaciones Tecnológicas de Desarrollo Agropecuario, Bolivia
FUNICA	Fundación para el Desarrollo Tecnológico Agropecuario y Forestal de Nicaragua
GSCRI	Guangxi Subtropical Crops Research Institute, China
GT-ASA	Group Thematique de Agriculture et Securité Alimentaire, Haiti
GUIA	an NGO group, Honduras
HPM	Ha Giang Development Project for Ethnic Minorities, Viet Nam
IAHS	International Association of Hydrological Sciences
ICADE	Instituto para la Cooperación y Autodesarrollo, Honduras
ICIMOD	International Centre for Integrated Mountain Development, Nepal

IDB	Inter-American Development Bank, USA
IDS	Institute of Development Studies, UK
IFAD	International Fund for Agricultural Development
INTA	Instituto Nacional de Tecnología Agropecuária, Nicaragua
INTEP	Instituto Técnico Profesionales, Roldanillo, Colombia
IPRA	Investigación Participativa en Agricultura / Participatory Research in Agriculture of CIAT
IS	Information Systems Unit of CIAT
ISP	Instituto San Pedro, Yorito, Honduras
IWMI	International Water Management Institute
LEISA	Low External Input Sustainable Agriculture Journal
LLSP	Livelihoods and Livestock Systems Project
LRC	Livestock Research Center, Lao PDR
MACA	Ministerio de Asuntos Campesinos y Agropecuarios, Bolivia
MARENA	Ministerio del Ambiente y Recursos Naturales, Nicaragua
MARNDR	Ministère de l'Agriculture et des Ressources Naturelles et du Développement Rural, Haiti
MEN	Ministerio de Educación Nacional, Colombia
MOVIMONDO	NGO for international cooperation and solidarity, Honduras
NAFRC	Northern Agriculture and Forestry Research Center, Lao PDR
NAFRI	National Agriculture and Forestry Research Institute, Lao PDR
NCHS	National Center for Health Statistics
NIAH	National Institute for Animal Husbandry, Viet Nam
OCISP	Oudomxay Community Initiatives Support Project, Lao PDR
ORE	Organism for the Rehabilitation of the Environment, Haiti
PITA	Proyectos de Innovación Tecnológica Agropecuaria
POSAF	Programa Socioambiental y de Desarrollo Forestal of MARENA, Nicaragua
PRDU	Participatory Research for Development in the Uplands
PROINPA	Fundación Promoción e Investigación de Productos Andinos, Bolivia
RENOC	Red Nacional de Organizaciones de Cuencas, Nicaragua
RIDP	Rural Income Diversification Project, Viet Nam
RII	Rural Innovation Institute of CIAT, Colombia
SADU	Small-scale Agro-enterprise Development in the Uplands
SAG	Secretaria de Agricultura y Ganadería, Honduras
SCA	Swiss College of Agriculture
SDC	Swiss Agency for Development and Cooperation
SENA	Servicio Nacional de Aprendizaje, Colombia
SENASA	Servicio Nacional de Sanidad Agropecuária, Honduras
SERNA	Secretaria de Recursos Naturales y Ambiente, Honduras
SIBTA	Sistema Boliviano de Técnología Agropecuario
SIPP	Sistemas Integrados de Producción Pecuaria
SOL	Supermercado de Opciones para Ladera
TC	Technical Committee of CONDESAN
TUAF	Thai Nguyen University of Agriculture and Forestry, Viet Nam
UBC	University of British Columbia, Canada

UMATA	Unidad Municipal de Asistencia Técnica Agropecuária, Colombia
UNA	Universidad Nacional Agraria, Nicaragua
UNAN	Universidad Nacional Autónoma de Nicaragua
UNN	Universidad Nacional de Nicaragua
USAID	United States Agency for International Development, Washington
VASI	Vietnam Agricultural Science Institute
WFCP	Water and Food Challenge Program
WGPAP	West Guangxi Poverty Alleviation Project, China
WV	World Vision
XADP	Xieng Khouang Agricultural Development Project, Lao PDR

Abbreviations

ARI	acute respitory infection
CBO	community-based organization
ESA	environmental sensitive area assessment
ESSA	environmentally and socially sensitive areas
GIS	geographic information systems
GO	government organization
GPS	global positioning system
mz	*manzana* (0.70 ha)
NGO	nongovernmental organization
NTFP	non-timber forest products
PES	payments for environmental services
PM&E	participatory monitoring and evaluation
qt	*quintal* (50 kg)
R&D	research and development
TDS	total dissolved solids
TOR	terms of reference
TT	technology transfer
UTI	urinary tract infection