PROJECT PE- 3
Communities and Watersheds

SUMMARY
October 2003

CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

SUMMARY ANNUAL REPORT
2003

PROJECT PE-3

COMMUNITIES AND WATERSHEDS

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PE-3 PROJECT
Communities and Watersheds

Research Framework

The ultimate goal of the Communities and Watersheds (C&W) Project is to safeguard water, food, and environmental health through research on land-water-community interactions. We utilize an integrated research framework (Figure 1) to organize and analyze interdisciplinary information, starting with the status and dynamics of the resource base, an evaluation of the interactions, determination and analysis of potential options, and finally replication of successful methods or approaches. While our focus is biophysical, we draw from the social sciences to better understand resource management, and utilize community-based methods to ensure local relevance to our research.

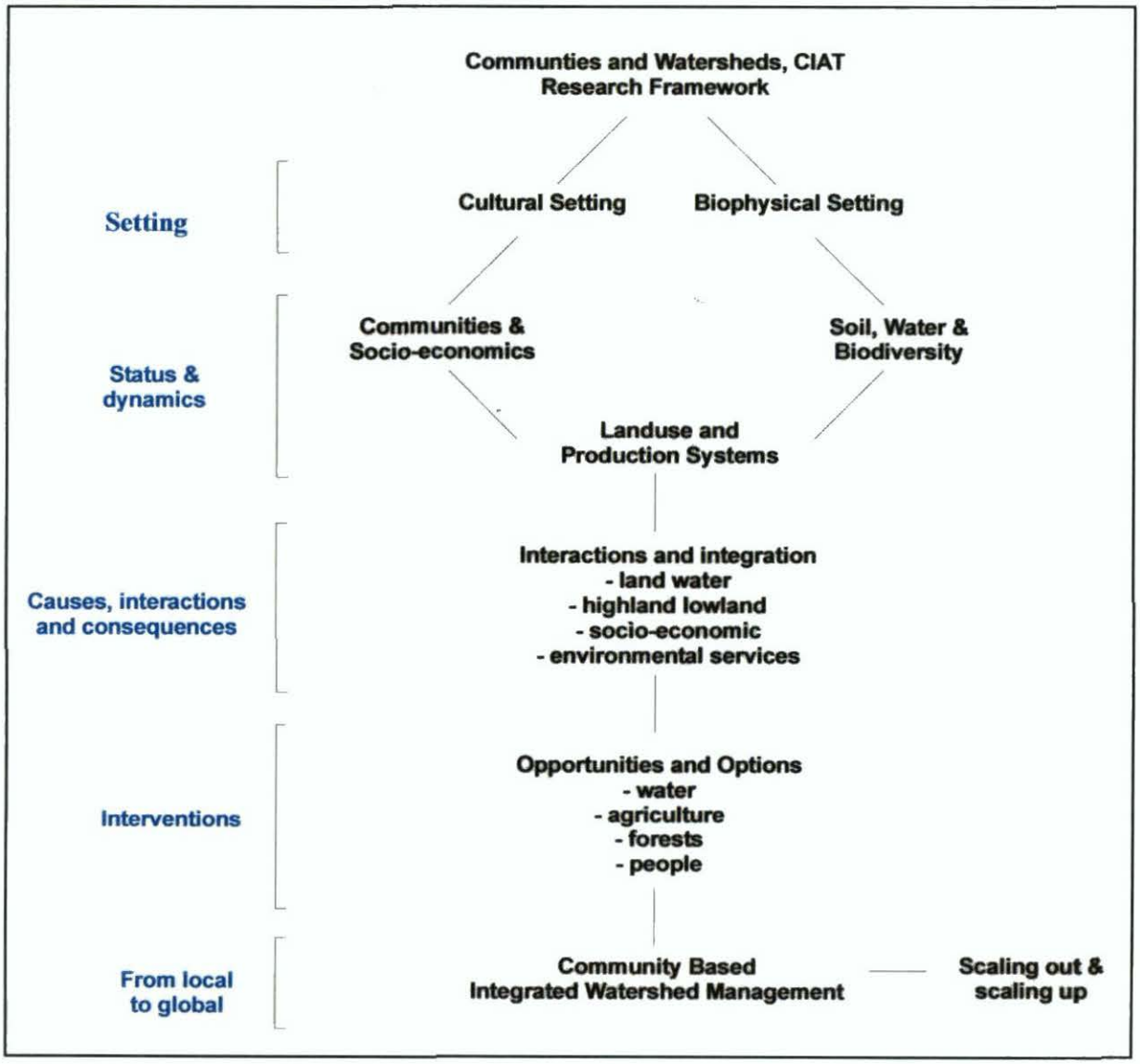

Figure 1. Communities and Watersheds' research framework.

The research program focuses on four components:

(1) Land-water interactions: How do land use and land management impact water quality, quantity, and distribution?
(2) Highland-lowland interactions: How do water quality, quantity, and distribution vary downstream, and what are the social and environmental consequences?
(3) Environmental services: How do we value environmental services considering varying social, environmental, and political perspectives?
(4) Community-based research for development: How do we integrate rural communities in research relevant to development issues?

Our primary clients are local organizations, local governments, and farmer groups. Research institutions, national governments, and nongovernmental organizations (NGOs) are secondary clients, and the final beneficiaries are the farmers and communities.

Our approach is interdisciplinary. We work in a scale-nested manner from farms to communities, microwatersheds, and finally watersheds (10,000 ha). We maintain an explicit focus on youth as leaders for tomorrow and long-term local partners. And to guarantee short- and long-term impact, we highlight best bets and success stories, in terms of methods, approaches, technologies, and activities.

Various tools and methods will be utilized, but core to the project's work are geographic information systems (GIS) mapping and modeling, case study watersheds for comparative analysis, and a minimum indicator set used in all watersheds. Indicators have been developed for each component of the research framework (Figure 1) and for farm, community, and watershed scales. Innovative technologies such as CD-ROM and Web sites are central to our information dissemination strategy.

Since the research framework is new to the team, we will initially concentrate on two pilot watersheds in each region (Central and South America). In the pilot watersheds, we will develop concrete research projects, baseline studies, hotspot analysis (environmental and socially sensitive area analysis), common indicators, monitoring, data collection and analysis, interactions, options and activities, and ultimately enhance team capacity for improved community-based watershed research.

Alliances

Partnerships and strategic alliances allow us to build on our strengths and have a broader perspective. Our core alliances are with the Institute for Resources, Environment and Sustainability (IRES) at the University of British Columbia (UBC) in Canada, the Tropical Agriculture Research and Higher Education Centre (CATIE, the Spanish acronym) in Costa Rica, and the Center for the Investigation of Sustainable Agricultural Production Systems (CIPAV, the Spanish acronym) in Colombia. In addition, we link to various project alliances, such as the Consortium for the Sustainable Development of the Andean Region (CONDESAN, the Spanish acronym), the Nicaraguan Institute for Agricultural Technology (INTA, the Spanish acronym), and the Sustainable Agriculture and Natural Resource Management (SANREM)

project of the Collaborative Research Support Project (CRSP) of the United States Agency for International Development (USAID).

Indicators

The C&W has developed a minimum indicator set for watershed analysis linked to our research framework (Figure 2). For each component of our framework (soil, water, land use, etc.) we have compiled indicators that will be monitored in each of our four pilot watershed sites. Our minimum indicator set includes both biophysical and socioeconomic indicators, such as water quality parameters, soil fertility, agrochemical inputs, landholdings, population density, and septic systems. Common indicators allow C&W to monitor change over time, and compare between pilot watersheds. Spatial patterns in indicators will be evaluated using GIS, and data will be integrated using indices (e.g., water quality index) to summarize complex information. We will also use a watershed profile (Figure 3) to display the scores for all indicators together because we feel this is a useful tool for integration and communication.

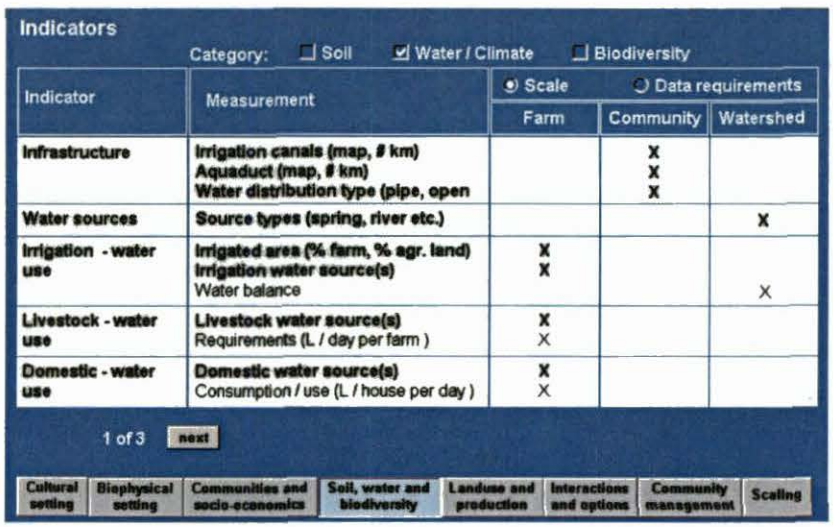

Figure 2. Minimum indicators used for comparative watershed assessment.

Common reference indicators allow the C&W team to compare conditions in one watershed with other watersheds, and will be one of our trademark activities. Our four pilot watersheds represent a range of issues, such as intensive agriculture, water scarcity, and alternative production systems, and as such allow us to evaluate similarities and differences. Comparability between watersheds allows us to share information and exchange successful methods and techniques that are contributing towards improved food, water, and livelihood security.

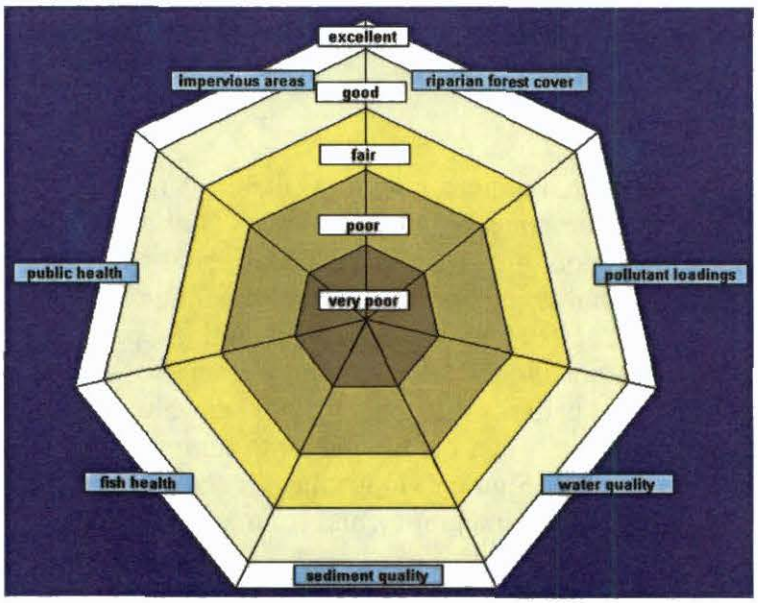

Figure 3. Watershed profile.

Project Description

Goal: To foster community-based watershed management (CBWM) to address local natural resource priorities and contribute to improved environmental management, equitable resource allocation, and enhanced livelihood and food security.

Outputs:
1. Improved watershed management: land-water interactions
2. More equitable highland-lowland resource allocation
3. Provision of environmental services: water, biodiversity, and recreation
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 methodologies developed with CIAT and its partners at research watersheds. Results are sustainable, production systems profitable, land use improved, and natural resources preserved at the watershed level. Partner organizations apply technologies, tools, and methodologies developed by or with the project for their planning and activities at local, national, and regional levels. Decision makers at various levels have information, tools, and methodologies provided by the project to support their planning, monitoring, and decisions.

Milestones:

2004 Establish monitoring networks and indicators for individual research sites / watersheds. Document land-water interactions, highland-lowland interactions, resource allocation inequity, and community priorities. Initiate capacity building programs at the local level. Promote the adoption of already proven approaches and technologies.

2005 Continuation of monitoring networks. Capacity building, strengthening local organizations, and training programs. Develop new technologies and approaches. Community-based adoption of proven methods and technologies. Improved local management using CIAT's research results.

2006 Continuation of monitoring networks. Community-based adaptive management with proven methods and technologies. Ongoing capacity building. Decision support providing information, tools, and methods at various levels (local, national, regional). Training programs. Improved watershed management using CIAT's research results. Scaling out.

Users: Farming families, youth, and rural communities of tropical watersheds. Project sites profit from increased community action aimed at improving watershed management. Educational institutions directly through youth involvement and student participation, and indirectly through access to research materials. National and international development organizations involved in priority setting and investments in development.

Collaborators: CATIE, CIP, IPCA, IWMI, IICA, CIRAD, CIPAV, CVC; universities of Georgia, Florida, Guelph, British Columbia (Canada), Nacional Agraria (Nicaragua), Hue (Vietnam); INTA, CONDESAN, ACERG, Herederos del Planeta, ASOBOLO, CGIAB, GTZ, ICIMOD, Grupo Randi Randi, KIB, PARDYP, RNRR, Campos Verdes, CLOs, CIALs, Hillsides Agricultural Program, Haiti (HAP).

CGIAR System Linkages: IWMI, CIP, CIMMYT, ICRAF, ILRI, IRRI, and Water and Food CP.

CIAT Project Linkages: Soils (PE-2), Land Use (PE-4), Agroindustries (SN-1), Participatory Methods (SN-3), Forages (IP-5), Impact Assessment (BP-1), Bean Improvement (IP-1), Cassava (IP-3), Rice (IP-4) Projects.

CIAT PE-3 Project Logframe, 2003-2006

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

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal: To foster community based watershed management (CBWM) to address local natural resource priorities, and contribute to improved environmental management, equitable allocation, and enhanced livelihood and food security.	Water quality Biodiversity Conflict resolution mechanisms Income (monetary and/or in kind) Farmer adoption of technologies / methods	National and local statistics Local research	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 natural resource management (NRM) at research sites.	User groups (number and types) Institutions with community involvement Local capacity building – training programs Youth involvement in NRM Community-based involvement in watershed management	Field verification Institutional reports	Local partners continue project-related activities. Donors remain interested in the proposed project objectives, and continue to provide support.
Output 1 Improved watershed management based on knowledge of land-water interactions. Farmers adopt approaches and technologies developed with CIAT and its partners to establish environmentally sound management and livelihood alternatives.	Land-water interactions: Water quality Land use change / intensification/ diversification Soil erosion Nutrient management Productivity	Local research Field verification Project reports Youth reports Local research groups' reports	Climate variability is normal.

Continued.

CIAT PE-3 Project Logframe (continued).

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Output 2 More equitable resource allocation based on highland-lowland interactions and trade-off analysis. Identify and monitor indicators of highland-lowland resource interactions. Promote community-based approaches for resolution of inequities.	Highland-lowland interactions: Erosion Water quality Water quantity (drinking and irrigation) Trade-off analysis: Water rights/ concession Income distribution (highland-lowland) Livelihood opportunities Conflict resolution: User association participation Consortium functioning Policy and/ or institutional changes	Local research Field verification Youth reports CIAL reports Consortia reports Monitoring reports	Social stability
Output 3 Valuation and analysis of environmental services, including water, biodiversity, and recreation. Adoption of sustainable management practices by local farmers and user groups. Increased forest and agricultural biodiversity. Realizing the potential of recreational opportunities.	Water: Water quality Water quantity Biodiversity: Native vs. exotic species numbers (temporal and spatial) Agrobiodiversity (number and type) Recreation: Types and no. of suppliers Eco-tourism	Field verification Local research CIAL reports Youth reports *Institutional reports*	Climate variability is normal.
Output 4 Strengthened organizations. Local and national organizations involved in sustainable agricultural development at various levels (site, national, regional) use the technical and methodological resources developed by the project in their decision making and other activities. Inter-institutional coordination is enhanced.	Training programs (number and type) Youth group formation and activities User groups supported (number and type) Digital information (number and type) Decision support mechanisms Information dissemination (format and content)	Local research groups' reports Youth reports Training reports Institutional reports Dissemination materials and project reports	Social stability

Continued.

CIAT PE-3 Project Logframe (continued).

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Output 5 Efficient use of project resources through participatory project management. Internal and external partners directly participate in project management to ensure adequate and efficient use of the project's resources.	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.	Planning documents, proposals, and reports Dissemination materials and project reports Direct verification through networks and consortia Reports to donors Annual reports	Institutional linkages maintained

Investigators:

Colombia:	
José Ignacio Sanz	PhD Soil Science, Project Manager
Vicente Zapata	EdD Adult Education, Institutional Capacity Building
Katherine Tehelen	BSc Industrial Engineer, Administrative Assistant
Andrea Carvajal (50%)	BSc Journalist, Documentation Center
Sandra Dossman	BScGraphic Designer, Communications Assistant
Adriana Domínguez	BSc Finances, Bilingual Secretary
Sandra Brown (50%)	PhD Resource Management, Senior Research Fellow, UBC-CIAT Alliance
Gregoire Leclerc	PhD Physics, Consultant, Book Editing
Jorge Rubiano (40%)	PhD Geography, Posdoctoral Fellow
Pedro Lorenzo Burgos	BSc Agronomic Engineer, Research Assistant
CIAT – CONDESAN in Colombia	
Rubén Darío Estrada	MSc Economist, Leader Policy Analysis
Ernesto Girón	BSc Topographic Engineer, Research Expert
Ximena Pernett	BSc Agronomic Engineer, Research Assistant
Costa Rica	
Mario Piedra	PhD Agricultural Economics, Senior Staff, CATIE-CIAT Alliance
Eliécer Vargas (50%)	PhD Agricultural Economics, 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
Jannie Goedkoop	Psychologist and Teacher, Consultant, Youth Project
Juan Evangelista	BSc Forestry Engineer, Research Assistant
Amy Fournier (*)	BSc Environmental Scientist/Waste Management Specialist, Youth Project
Nicaragua:	
Jorge Alonso Beltrán	MSc Agronomy, Liaison officer
María Eugenia Baltodano	BSc Economist, Bioeconomic modeling, Research Assistant
Gilles Trouche (50%)	PhD Plant Breeder, Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) – CIAT
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	FLSP Project Director and Regional Coordinator of CIAT in Asia
Keith Fahrney	PRDU Project Director
Peter Horne (40%)	Regional Coordination
Phonepaseuth Phengsavanh	CIAT Regional Research Fellow (20% with FLSP)
Chintana Chanhdeng	CIAT Financial Administrator (100% with FLSP)
Panida Phommalisack	Administrative Assistant (70% with FLSP)
Sukanya Chanhdeng	Technical Assistant (100% with FLSP)

Students:

Colombia:
María Cecilia Roa, PhD studies, UBC

Honduras:
Lina Andrea García, MSc studies, CATIE

Costa Rica:
Ricardo Calles, MSc studies, CATIE

(*) Left during 2003

Collaborators:

Within CIAT: See under CIAT project linkages, project description, page 8.

Outside CIAT: See under Collaborators and System linkages, project description, page 8.

Financial Resources:

Headquarter & Latin America

Source	Amount (US$)	Proportion (%)
Unrestricted Core	541,652	44%
Restricted Core		0%
Carry over from 2002	56,522	5%
Sub-total	**598,174**	**49%**
Special Projects	624,275	51%
Total Project	**1,222,449**	**100%**

Asia

Source	Amount (US$)	Proportion (%)
Unrestricted Core	39,535	4%
Restricted Core	0	0%
Carry over from 2002	78,514	9%
Sub-total	**118,049**	**13%**
Special Projects	796,125	87%
Total Project	**914,174**	**100%**

Africa

Source	Amount (US$)	Proportion (%)
Unrestricted Core	0	0%
Restricted Core	0	0%
Carry over from 2002	0	0%
Sub-total	**0**	**0%**
Special Projects	137,273	100%
Total Project	**137,273**	**100%**

Research Highlights in 2003

This year we highlight seven areas of our current research work.

(1) New Research Framework and Indicators Set

We have begun implementing the new research framework (see Figure 1) in the pilot watersheds in Colombia (2), Honduras (1), and Nicaragua (1) where our work is focused. We have been working on the settings, status, and dynamics of these watersheds. We have developed a minimum set of indicators (Figure 2), which we use for comparative watershed assessment, and which is linked to our research framework (see page 6 for details).

(2) Research Work in the Mid-Garrapatas Watershed, Colombia

This year, our project and partners have concentrated on analyzing the current conditions that need to be improved in this watershed, according to the project objectives, setting up the basis for participatory research activities, and designing schemes for the sustainability of the project. General surveys are being conducted, and are directed to particular locations, depending on the research topics that have been chosen by the youth groups. Themes have already been selected, within which there are research topics. The youth groups are located in different parts of the watershed, and have different and growing numbers of members. They are coordinated by CIAT or partner organizations. At the same time, the baseline geographic information is being carried out in alliance with the municipality of El Dovio, and with the participation of neighboring municipalities, and the baseline map is being developed. In the same project, youths are working on food security, major staple food diet components, bio-intensive vegetable gardens, alternative animal production systems, rural agroenterprises, and in specific environmental research. These are all topics that are being linked to the baseline information, and are being linked to the environmentally and socially sensitive areas (ESSA) methodology, all within the context of integrated watershed management with the participation of youth.

(3) Research Work in the Bolo Watershed, Colombia

This is an area of conflict, where we have been accompanying the Asociación de Usuarios del Río Bolo (ASOBOLO). It is one of the sites chosen for the Water and Food Challenge Program (WFCP). Our project assisted ASOBOLO in entering the World Water Council, 3rd Water Forum water action contest, which sponsored grass-roots organizations to attend the Kyoto conference. ASOBOLO was selected as one of the top 150 organizations, and was the only Colombian NGO selected. At the Global Water Forum, ASOBOLO was recognized as one of the top 10 organizations globally. The project and ASOBOLO developed a poster and presented it in Kyoto. The poster shows the geographical position of ASOBOLO, gives some information about the organization, and explains a little of what it does, and how it would like to expand its work both with people and in the area covered.

(4) Research Work in the Tascalapa Watershed, Honduras

There has been significant advance in the compilation of information for the baseline data for watershed management. Geographic information systems have also been put in place at detailed scales, in a way that will permit interpretation and analysis, and identification with ESSA criteria. Meanwhile, the 1-year old youth project continues, and already has 271 members belonging to different Local Agricultural Research Committees (CIALs, the Spanish acronym) that they have formed. Youth activities have been centered in those communities in the subwatershed where they are located, so there is a coverage of the watershed, and they are accompanied by the project partners. The young people have selected research topics, have advanced the first round of data, and are working on final results of some of the topics. Many training activities have been organized, among other activities for these groups, by different organizations and project members. The youth groups have been able to negotiate getting extra funding, for example from the Fondo Canada for local initiatives in Honduras, and have stimulated the Instituto San Pedro (ISP), the school mostly involved in the project. The school has appointed a room for the project where computers are installed, and where students can work, have classes, and all meetings related to the project. The youth groups, based on their training, have established the new wetland to filter the surface waters that come out of the houses of the town of Yorito, where there is no aqueduct. They also initiated the establishment of a wasteland to change the current location of the garbage dump that was polluting the waters of the rivers.

Parallel to these activities, we have been involved also in work on the influence of land use on the quality of water, and determination of indicators. This is because there is a severe problem of water quality in this watershed, so we have been analyzing the disturbance suffered in the sources of natural water, potential water sources for supply to human settlements. Physicochemical methods traditionally have been used, but only give reliable data on the state of the water, so we are using biological analysis, based on organisms, because it provides data of what occurred days and hours before taking the sample. This does not replace physicochemical data, but overlaps in a complementary manner. The present study characterizes the quality of the waters of the river system of the Tascalapa River subwatershed. There was a general community consensus on the list of indicators, and now the information will be confirmed with the technical information of the monitoring of water quality from our sample stations.

(5) Research Work in the Cálico Watershed, Nicaragua

As with the other three watersheds, we have been working hard on the baseline information. A great deal of information has been collected, but we are working on some gaps that remain. With regard to ESSA, we try to get to smaller scales than those mostly available. There is an alliance between INTA, Universidad Nacional Agraria (UNA), and CARE-International to work on this analysis in 2004. In this watershed, as in those mentioned above, the Supermarket of Technology Options for Hillsides (SOL, the Spanish acronym) sites work continuously in an integrated manner with the other CIAT projects. As a result of the ESSA analysis, results from the SOL will be migrating to where they should be located in the landscape. Meanwhile, much of the SOL technology has been spreading to other parts of the watershed, and this we need to follow and accompany to see what impacts occur. This scaling out is happening in a natural manner.

(6) Haiti

We have almost finished the baseline preparation, and have established the Small Seed Production Agro-enterprises (PES, the Spanish acronym). This was work done with Haitian organizations, CIAT Haitian staff, and C&W staff deployed from Central America to support the Haitian team. A number of activities have begun, but USAID decided to stop funding, so the project stopped. However, lately we have found additional funding to bridge the gap until further funding is available. We are preparing and submitting proposals to try and continue the work.

(7) Project Proposals

In this early stage of the project, we have invested a considerable amount of time in proposal preparation, including close work with partners and donors. We have close links with CONDESAN in the Andes, where we are working together, having a shared CONDESAN-CIAT scientist. We have submitted two concept notes to the WFCP that were invited for development of a full proposal. The proposal is entitled "Scaling Water Use, Quality, and Equitable Water Distribution Issues in the Andes and Himalayas", and is to work also within the strategic alliance with the UBC. The Andean part will be work mostly with CONDESAN and its partners, in our sites in Colombia and CONDESAN sites in Ecuador and Bolivia, and the Himalayan part will use the sites where the UBC has been working.

The strategic alliances with UBC and CATIE have been further strengthened with a shared appointed scientist, and a shared research framework. Partners are involved in most proposals being prepared for funding.

Problems Encountered and Their Solutions

The number of problems previously encountered has a clear trend to diminish or almost completely disappear. The development of our conceptual framework and our research framework has provided the project team with a light at the end of the tunnel. The team is very clear about what has to be done, and very committed to achieving it. The team also acknowledges that the project is in its early life, and we have to focus and generate data before we can formulate results. CIAT has been very supportive of this process, and we are moving along. Perhaps the only difficulty is the increasing one of funding, but we are optimistic that the number of proposals submitted will bring in sufficient funds to keep the project alive.

Proposed Plans for Next Year

The plan for next year is to continue our movement along the proposed research framework, to cover the next points, fill in the baseline and the gaps in information, advance ongoing projects, and try to link past work more with the new approach of the project—integrated watershed management with community participation. We aim to further strengthen our alliances and develop our framework beyond our focus sites with our partners. Although not reported on this year, we have begun to develop CD-ROMs of the different pilot sites so that they will be filled with information yearly, and will show information beyond the pilot sites. We will continue to cover the outputs from the logframe.

Project Performance Indicators: Communities and Watersheds 2003

1. Technologies, Methods, and Tools

1.1. Training in participatory research methods

Training was given to youth groups on the bio-intensive method of kitchen gardens, forestry management and nursery establishment, mapping, conflict management, computers, water quality, establishment of a watershed, the CIAL methodology, and preparation of pizza and different kinds of cake, jams, and marmalade within the communities. In Haiti, the first maize and bean training course for technicians, extension workers, and farmers from NGOs and community-based organizations (CBOs) took place on the 14-25 October 2002. For Seeds of Hope, Central America, the Food and Agriculture Organisation (FAO) and CIAT gave training and assistance to the NGOs involved in the project development. In addition to the integrated framework, C&W has provided training to the SANREM team in both Ecuador and the United States on the use of Toolbook© multi-media authoring software. During May, a first training course for facilitators was carried out at the Fundación para la Investigación y Promoción de Productos Andinos (PROINPA) headquarters. Thirty-one participants from 21 institutions and programs attended. Finally, at CATIE, training was given on the "Econometrics issues for estimating consumer's welfare with linear models departing from travel cost data", and "The importance of shifting from financial to economics analysis while drafting forestry and environmental projects."

1.2. Genetic materials and technologies evaluated

Colombia: Bamboo management and transformation, and bio-intensive vegetable gardens evaluated by youth group of the Garrapatas watershed.

Honduras: In SOL sites, selection of germplasm for crop diversification.

Nicaragua: In SOL sites, determination of nutrients, nutrient flows and use of organic material, and development of crop systems with the use of cover legumes and green manure.

1.3. Databases or maps

Baseline maps and databases are in progress for focus watersheds.

1.4. Support tools (models/software)

A new version, on CD-ROM, of the five most demanded decision support tools (DSTs) was prepared, following the Tool Book format.

2. Publications

2.1. Refereed journals

Published: 1 article
In press: 3 articles
Submitted: 4 articles

2.2. Book chapters
In press: 5

2.3. Published proceedings
Published: 1 article
In press: 1 article

2.4. Scientific meeting presentations
Presentations 4

2.5. Working papers, other presentations or publications
17

(See Appendix I)

3. Strengthening NARS

Bolivia: The C&W Project has deployed Vicente Zapata, to serve in his educational capacity, to new activities that are being carried out by Participatory Research in Agriculture (IPRA) in Bolivia. This contribution links with prior and current efforts to strengthen CIAT's presence in Bolivia. The essence of this initiative is to contribute to the National Agricultural Technology System (SIBTA, the Spanish acronym) to establish participatory monitoring and evaluation systems within the current Agricultural Innovation Projects (PITAs, the Spanish acronym) and Strategic Innovation Projects (PIENs, the Spanish acronym), which are key mechanisms for agricultural development in this country.

Colombia: In the Garrapatas watershed, CIAT continues its alliance with the local environmental agency, the Corporación autónoma regional del Valle del Cauca (CVC) that deals with policy at this scale.

Honduras: The Corporación Hondureña de Desarrollo Forestal (COHDEFOR) and Servicios Técnicos para el Desarrollo Sostenido (SERTEDESO) continue their strong alliances with CIAT and frequent visits to the SOL, following interests in integrated management of watersheds and CIAT activities in the region, and germplasm selection for crop diversification. Youth groups are participating in a mapping in Yorito and La Sabana with the Programa de Administración de Areas Rurales (PAAR).

Nicaragua: Activities of analysis and map interpretation at scales less than 1:5000 (GIS), and the identification of ESSA, are being prepared and will be done during 2004, with the project of strategic alliance between INTA, UNA, and CARE-International, financed by the Foundation for Technological Development in Agriculture and Forestry (FUNICA, the Spanish acronym). Based on discussions with Gustavo Cordova (Director of Extension) and key Integrated Watershed Management workshop participants (see below), a concept note on water and food security was drafted as a follow-up activity between the CIAT Nicaragua–INTA team This 1-year project was developed as a direct result of the success of the workshop, both technically and institutionally, through the enhanced CIAT-INTA linkage.

3.1. Training courses

Bolivia: During May, a first training course for facilitators was carried out at PROINPA headquarters. Thirty-one participants from 21 institutions and programs attended.

Colombia: Internal C&W Toolbook© training focused on design, layout, basic authoring, and CD-ROM production. Internal training will be ongoing as we incorporate our baseline studies, indicators, and research results for our long-term watershed research sites

Costa Rica: Training was given on the "Econometrics issues for estimating consumer's welfare with linear models departing from travel cost data" at CATIE's training course on Environmental Economics and Valuation of Goods and Environmental Services, 23 Sept to 4 Oct 2003. Training was also 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, 7-18 Oct 2003.

Ecuador: In March 2002, a group of officials from CIAT, CIPAV, and the Asociación de Centros Educativos del Cañon del Río Garrapatas (ACERG), as well as members of the community, participated in a training session on the Bio-intensive method of kitchen gardens that took place in Ecuador over 15 days. Also, C&W has provided training to the SANREM team in both Ecuador and the United States on the use of Toolbook© multi-media authoring software.

Haiti: A course in "Seed Technologies" was given 13-26 October 2002 in which not only farmers, extension workers, and CBO coordinators participated, but also PanAmerican Development Foundation (PADF) technicians who support the project, as well as technicians of agencies collaborating in increasing the basic CIAT seed—Operation Double Harvest (ODH) in the north, and Vincent Foundation in the south. The first maize and bean training course for technicians, extension workers, and farmers from NGOs and CBOs took place on the 14-25 October 2002. A course was given also in the north of Cap-Haitien and another in the southeast, in Jacmel. Forty-six participants attended from 13 CBOs and two NGOs.

Honduras: On 8th July 2003, training on the monitoring of water quality and basic knowledge on use and management of the water resource was given to ISP-CIAL youths, and was attended by 18 students and three technicians. On 14th August 2003, training on the integrated management of watersheds was given to ISP, Investigación Participativa en Centro America (IPCA), and COHDEFOR. Twenty students and 10 technicians attended. On 19th August 2003, training was given to CIAL youths on basic forestry concepts, and basic concepts on installation and management of nurseries and reforestation. Eighty-five students and eight technicians attended.

Nicaragua. A 1-week workshop on "Integrated Watershed Management", led by C&W (Roa, Brown, and Beltran) was held in Matagalpa in March. The objective of the workshop was to support INTA professionals in their effort to adopt methods for improved watershed management. Forty-five participants from the five INTA zones, INTA Central, and Universidad Nacional Autónoma de Nicaragua (UNAN), Matagalpa completed the intensive short course.

3.2. PhD, MSc, and pregraduate thesis students

Colombia	María Cecilia Roa, PhD studies, UBC, continues until Sept. 2006.
Costa Rica	Ricardo Calles, MSc studies, CATIE, continues until December 2003.
Honduras	Lina Andrea García, MSc studies, CATIE, continues until December 2003.

3.3. Technical assistance

Technical assistance is given in the work of the PES in Haiti and Central America.

3.4. ARO research partnerships

Our core alliances are with IRES at the UBC in Canada, with CATIE in Costa Rica, and with CIPAV in Colombia. The C&W has pre-existing US university linkage fund money to work with Robert Rhoades, Ecological Anthropology, University of Georgia, on the SANREM – Andes project in Cotacachi, Ecuador. We also continue our link with the University of Guelph on the Youth project.

Alonso Moreno, Principal Advisor of German Technical Cooperation (GTZ), knowing of our Canadian International Development Agency (CIDA) and Rockefeller Foundation-funded youth projects, invited us to develop together an Andean Youth project on integrated watershed management for the pilot sites of CONDESAN. C&W provided existing information from our ongoing youth projects (one in a CONDESAN pilot site for the WFCP), and Alonso is drafting a preliminary proposal to agree upon with our C&W team, including Ruben Dario Estrada. Once agreed, Alonso will do the lobbying with GTZ in Germany.

4. Resource Mobilization

4.1. Proposals funded

- C&W, under the lead of JI Sanz and S Brown, submitted a concept note and subsequently full proposal to the CGIAR Challenge Program on Water and Food entitled "Scaling Water Use, Quality and Equitable Water Distribution Issues in the Andes and Himalayas". Our concept note was highly ranked by the independent review panel, and our full proposal was submitted for funding totaling US$850,000 to start in January 2004 until December 2006. The project will be implemented in eight watersheds, four in each mountain region (Andes / Himalaya). A National Agricultural Research and Extension System (NARES), NGO, or international project will lead the local-level research activities in each watershed. CIAT will coordinate comparisons between watersheds, and UBC will provide academic / methodological support. The WFCP Consortium Steering Committee has selected the proposal as part of the portfolio of 50 approved projects from the first call. This decision means that the proposal is endorsed as suitable to be marketed by the WFCP as a good, fundable project, relevant to their goals. The proposal was not amongst the 16 approved for immediate contract negotiations, because of limits on funding available. However a further 5-10 approved projects will be invited to negotiate as additional core funding becomes available.

- "Validation of Crop Systems with Legumes Introduced as Green Manure / Cover Crops on the Sustainability of Traditional Production Systems." This proposal aims to identify and diffuse crop systems with the use of legumes, which improve fertility and reduce soil erosion, in the Wibuse-Jicaro microwatershed, Nicaragua. The donor approached for funding, FUNICA, has approved US$10,000 in total with US$2000 for CIAT activities. This activity is developed with producers.

4.2. Proposals and concept notes submitted

- Based on discussions with Gustavo Cordova (Director of Extension) and key workshop participants, a concept note on water and food security was drafted as a follow-up activity between the CIAT Nicaragua–INTA team. Jorge Alonso Beltrán led the process of developing and submitting the full proposal, "Facing the Challenges of the Millenium" to FUNICA for financing. This proposal aims to strengthen the institutional capacity of INTA, in alliance with CIAT-UNA-CARE International and local partners, in the focus on integrated management of watersheds. It is based in the subwatershed of the Cálico River, San Rafael-La Concordia, Nicaragua. The total amount of funding is US$120,000, of which US$67,000 is allocated to CIAT activities.
- "Methodological Development for Understanding the Socioeconomic and Institutional Factors that Drive Land Degradation in Central America: The Case of Nicaragua and Honduras." The project aims to model the effect that alternative profitable sustainable production systems—aiming at better land use and natural resource conservation—have in three watersheds in Honduras and Nicaragua. An Integrated System for Decision-Making Analysis at the Watershed level (ISDAW) will be developed and utilized in collaboration with national and regional institutions. Capacity building and outreach will be implemented through CATIE's M.Sc. Environmental Socioeconomics and Ph.D. in Socioeconomic Aspects of Water and Land Resources programs, plus national and regional workshops. The proposal has been endorsed in its Adobe Portable Document Format (PDF) form by the Global Environment Fund (GEF) political and operational focal points in both countries. Currently, the PDF format in under revision at United Nations Environment Program's (UNEP's) Headquarters in Nairobi, Kenya. Project coordinators are Dr. Mario A. Piedra and Dr. Eliécer Vargas.
- "Agroforestry Project San Dionisio: An Experience in Capitalization, Conservation, and Utilization of Tree Resources in the San Dionisio Watershed in Nicaragua". The project recollects successful experiences in establishing agroforestry systems as a means of increasing income and reducing the impact of current hillside production systems on the natural resource base in dry forest ecosystems. The project comprises packages of interventions to improve both livelihoods and the economic well-being of local people (baseline actions), and to preserve or restore ecosystems functions and services through sustainable land management (incremental actions). The proposal has been endorsed in its PDF form by Nicaragua's GEF political and operational focal points. Project coordinators are Dr. Mario A. Piedra and Dr. Guillermo Navarro.
- A preliminary Concept Note on "Options and Actions for Water and Land Quality, Quebrada Grande Watershed, Colombia" was submitted to the International Development Research Center (IDRC). We are in communication with IDRC about improvements to the Concept Note before moving on to a formal proposal.

- "Youth in Watershed Research for Water-Land Management". This concept note has been submitted jointly with CIPAV and Herederos del Planeta to IDRC for consideration. The goal is to contribute to the development of improved local-level natural resource management (NRM) practices focusing on water as a scarce resource, vegetation for recuperation of degraded areas, and innovative production systems that conserve water and biological resources. The study area is the Quebrada Grande watershed, Valle de Cauca, Colombia – one of C&W's long-term research sites. The approach used for the analysis and research of the biophysical components incorporates the active participation of local communities as research partners, and the full integration of youth into research activities.
- CONDESAN and C&W have submitted a concept note to GTZ to expand the youth and environmental research initiatives developed at C&W-CIAT to other CONDESAN sites throughout the Andes. The goal is to provide alternatives to out migration for rural youth, while simultaneously enhancing NRM. Youth research initiatives in NRM, information technologies, youth-to-youth exchanges between countries, and a revolving fund for local initiatives are core activities. Youth groups will be established and/or existing groups support enhanced in Ecuador, Colombia, Peru, and Bolivia, building on our existing network of research watersheds.
- "Conservation, Restoration and Production in Rural Communities of the Non-protected Areas of the Mesoamerican Biological Corridor – Pre-project". Based on discussions with the donor—Norwegian Agency for Co-operation for Development (NORAD)—and project partners CATIE, CIPAV, CARE International, and UBC, we developed a proposal for a 1-year pre-project that would constitute the first phase of a long-term research initiative in the non protected areas of the Mesoamerican Biological Corridor (MBC). The immediate objective is a proposal for technical interventions, monitoring, and evaluation of improved land use in non-protected areas of critical importance in the MBC, developed by a multi-stakeholder group. GIS, hotspot analysis, local indicators, and baseline studies would be conducted in seven countries in central America with Phase II to focus on Nicaragua, Honduras, and Guatemala, the poorest countries in Central America, and the focus of NORAD's work. The participation from CIAT includes C&W and Land Use (PE-4).
- "Socioeconomic and Environmental Evaluation of Soil Erosion and Conservation" aims to examine the economic, environmental, and social profitability of agroforestry systems at the level of private farms. It is located in the subwatersheds of the Cálico River, Chile-Jinotega, and Tisey-Estanzuela, Estelí, Nicaragua. The donor approached for funding is the Inter-American Development Bank (IDB), through the Programa Socioambiental Forestal (POSAF), Nicaragua.

4.3. Resource mobilization activities

This year we have concentrated on getting funding for the Andean region for our pilot watersheds through a proposal to the WFCP. In Central America, we have also tried to mobilize further funding through FUNICA, CIDA Canada, and IDRC, but these last are only in the early stages of concept notes. The GEF project, coordinated by Mario Piedra, has been endorsed.

5. Impact monitored

Considering the early stages of the new C&W project, impact assessment has not yet been implemented, but activities are being planned, and are an integral part of the proposals submitted. The CIAT Impact Assessment group has a proposal for the WFCP that includes collaborative activities with C&W. We are also working on the possibility of a fallback proposal in case this is not approved. Together with Mario Piedra, the economist shared with CATIE, we are developing a concept note, which includes the participation of the Impact Assessment group.

Our research on community management of watershed resources is done in such a way that development activities go on together with the research process so, if development impact occurs, it can be seen directly in the site where we work. Also, the scaling out of the process shows. The initial approach of the SOL, seeking to incorporate only demand-driven research activities, has resulted in answers to the real needs of rural communities. Additionally, support to local organizations focused on very specific issues, has facilitated the evaluation of concrete techniques developed in SOL sites, and their expansion to farmers' plots and farms within the same watershed (scaling out).

The nature of our new research framework is intended to have continuous monitoring, which should give us trends that in turn could become impacts, e.g., water quality.

Appendix I

Publications

Papers in Refereed Journals

Bestbier, R.; Brown, S.; Schreier, H. 2003. Innovative information technologies and mountain communitites. GeoJ. (Submitted)

Brown, S. 2003. Gender, poverty and natural resource management in Nepal: A farmers' perspective. GeoJ. (In Press)

Brown, S. 2003. Gender, workload and inequity in Himalayan watersheds. GeoJ. (Submitted)

Brown, S. 2003. Spatial analysis of socio-economic issues: Gender and GIS in Nepal. Mountain Res.Dev. (In Press)

Brown, S.; Kennedy, G. 2003. A case study of cash cropping in Nepal: Poverty alleviation or inequity. Agric. Hum. Values. (In Press)

Brown, S.; Schreier, H. 2003. Linking culture, economics and resources in Nepal. Agric. Syst. (Submitted)

Luijten, J.C.; Sanz, J.I.; Jones, J.W. 2003. A role for GIS - based simulation for empowering local stakeholders in water resources negotiations in developing countries: Case studies for two rural hillside watersheds in Honduras and Colombia. Water Policy 5: 213-236.

Schreier, H.; Bestbier, R.; Brown, S.; Quiroz, R. 2003. Himalayan-Andean watersheds: A comparative study using information technologies. GeoJ. (Submitted)

Chapters in Books

Barbier, B.; Hernandez, A.; Mejía, O.; Rivera, S. 2004. Trade-off between income and erosion in a small watershed. GIS and economic modelling in the Río Jalapa watershed, Honduras. *In*: Leclerc, G.; Hall, C. (eds.). Making development work: A new role for science. New Mexico University Press. (In press)

Barito, F.; Piedra, M.; Páez, G. 2004. Modeling land use dynamics with remote sensing data: The case of intervened ecosystems in the central mountain range of Venezuela. *In*: Leclerc, G.; Hall, C. (eds.). Making development work: A new role for science. New Mexico University Press. (In press)

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

Zandbergen, P.; Brown, S. Schreier, H. 2003. Watershed management education and training CD-ROMs. *In*: France, R. (ed.). Handbook of water sensitive planning and design. CRC/Lewis. (In Press)

Zapata, V.; Ashby, J.A. 2003. Dissemination and application of decision support tools (DSTs) for natural resource management. Chapter 2. *In*: INRM Case Studies. Technical Advisory Committee-Secretariat (TAC-SEC) / Consultative Group on International Agricultural Research (CGIAR). (In Press)

Workshop and Conference Papers / Presentations

Amede, T.; Amézquita, E.; Ashby, J.; Ayarza, M.; Barrios, E.; Bationo, A.; Beebe, S.; Bellotti, A.; Blair, M.; Delve, R.; Fujisaka, S.; Howeler, R.; Johnson, N.; Kaaria, S.; Kelemu, S.; Kerridge, P.; Kirkby, R.; Lascano, C.; Lefroy, R.; Mahuku, G.; Murwira, H.; Oberthür, T.; Pachico, D.; Peters, M.; Ramisch, J.; Rao, I.; Rondon, M.; Sanginga, P.; Swift, M.; Vanlauwe, B. 2003. Biological nitrogen fixation: A key input to integrated soil fertility management in the tropics. Position paper presented at the International Workshop on Biological Nitrogen Fixation for Increased Crop Productivity, Enhanced Human Health and Sustained Soil Fertility, 10-14 June 2002, Ecole nationale supérieure agronomique (ENSA)- Institut national de recherche agronomique (INRA), Montpellier, France. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, IN. (In press)

Barbier, B.; Hearn, R.; Gonzales, J.M.; Nelson, A.; Mejía, O. 2003. Trade-offs between economic efficiency and contamination by coffee processing. A bioeconomic model at the watershed level in Honduras. Paper presented at the International Association of Agricultural Economists (IAAE) conference, 10 Aug 2003, Durban, ZA.

Binder, C.R. (ed.). 2003. Memorias del Taller de Escenarios para la Región de San Dionisio, Nicaragua, 12 a 15 Febrero 2002, Matagalpa, Nicaragua. Swiss Federal Institute of Technology (ETHZ), Natural and Social Science Interface, Zurich. Centro Internacional de Agricultura Tropical (CIAT)- Universidad Nacional Agraria (UNA), Cali, CO. 41 p.

Brown, S. 2002. Gender and natural resource management in Nepal. Paper presented at the Gender and Development in Asia workshop, 15 March 2002, University of British Columbia, Canada. Sponsored by Intercultural Studies in Asia, Institute of Asian Research, and Centre for Research in Women's Studies and Gender Relations.

Piedra, M. 2003. Perspectivas sobre la valoración económica de la biodiversidad. Invited paper presented at the United States Department of Agriculture (USDA)- Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)- sponsored Henry Wallace II Inter-American Scientific Conference Series, Financing Sustainable Rural Development in Tropical America: Innovations for Food, Security, Competitiveness and Conservation, 19-21 March 2003. CATIE, CR.

Piedra, M. 2003. Viewing multi-functionality in agriculture as a tool for development in the Latin American tropics. Invited paper presented at the Deutscher Tropentag, 8-10 October 2003, University of Goettingen, DE.

Technical Reports and Others

Baltodano, M.E. 2003. Valoración socio-económica de la erosión y conservación de suelos. Reunión anual del Manejo Integrado de Suelos (MIS), Marzo del 2003, Copan, HN. 30 p.

Baltodano, M.E. 2003. Valoración socio-económica de la erosión y conservación de suelos. Curso Internacional Teórico Practico sobre Ciclaje de Nutrientes y Valoración Económica a Escala de Fincas. Indicadores económicos y ambientales. 12-14 de mayo del 2003, Bogotá, CO. 36 p.

Davies, C.; Franco, J. B.; Beltrán, J.A. (eds.). 2003. Taller de Seguimiento y Evaluación Participativa, para los Comités de Investigación Agrícola Local (CIALs) y la Asociación Campos Verdes, San Dionisio, Matagalpa. CIAT – Comunidades y Cuencas - Investigación Participativa (IPRA), Nicaragua. Centro Internacional de Agricultura Tropical (CIAT), Managua, NI. 34 p. (Publication no. 16)

Hernández, R.; López, F.; Rivera, S.; Barbier, B. 2002. Escenarios de simulación de la tierra del uso de la tierra en la cuenca del río Choluteca. Tatascan 14(1):13-29.

Jonsson, A.; Wall, E. 2002. Resource flow mapping as a tool for improving soil organic matter management in smallholder hillside farmers in Nicaragua. Swedish University of Agricultural Sciences, SE. 55 p. (Minor Field Studies no. 213)

Méndez, E.; Piedra, M.; González, A.; Jones, J.; Páez, G. 2003. Análisis espacial del uso de la tierra en la cuenca del Río Turrialba, Costa Rica. Revista de Recursos Naturales y Ambiente. (Accepted)

Orozco, P.P.; Franco, J.B.; Beltrán, J. A. (eds.). 2003. Memoria de la II Feria de Tecnología Productiva y Alimentos Alternativos - "Por una vida mas sana, produciendo y consumiendo lo nuestro, en armonía con la naturaleza". San Dionisio, Matagalpa. CIAT – Comunidades y Cuencas, Nicaragua. Centro Internacional de Agricultura Tropical (CIAT), Managua, NI. 29 p. (Publication no. 15)

Sanchez, K.; Jimenez, F.; Piedra, M. 2003. Desarrollando una metodología de análisis multicriterio para la identificación de áreas prioritarias del manejo del recurso hídrico en la cuenca del Río Sarapiquí, Costa Rica. Revista de Recursos Naturales y Ambiente. (Accepted)

Sanz, J.I.; Ziegler, R.S.; Sarkarung, S.; Molina, D.L.; Rivera, M. 2002. Improved rice-pastures systems for native savanna and degraded pastures in acid soils of Latin America. Centro Internacional de Agricultura Tropical (CIAT), Cali, CO. 22 p.

Schreier, H.; Brooks, D.; Brown, S.; Bestbier, R. 2002. Agricultural watershed management. Institute for Resources and Environment, UBC. CD-ROM textbook.

Schreier, H.; Brooks, D.; Brown, S.; Bestbier, R. 2002. Water in international development. Institute for Resources and Environment, UBC, and International Research Development Centre (IDRC), Ottawa. CD-ROM textbook.

Tabora, F.; Faustino, J.; Jiménez, F.; Piedra, M. 2003. Desarrollo de un modelo de fondo ambiental para el manejo y conservación de los recursos de una microcuenca de Honduras. Revista de Recursos Naturales y Ambiente. (Accepted)

Talavera, P.; Galloway, G.; Piedra, M. 2003. Diversificación del uso del bosque: Una propuesta para aumentar la rentabilidad de la actividad forestal en el bosque comunitario Toncontín, Honduras. Revista de Recursos Naturales y Ambiente. (Accepted)

Walter, S. 2002. Evaluation of two GIS-based models for landslide prediction for Cálico River watershed, San Dionisio, Nicaragua. Masters Thesis, University of Hohenheim, DE. 74 p.

Zapata, V. 2003. Fortalecimiento de capacidades institucionales para el seguimiento y la evaluación participativos en proyectos de desarrollo en el ambito del PRONADERS – Honduras. CIAT, Cali, CO. 10 p.

Zapata, V. 2003. Informe sobre la difusion del paquete de cinco instrumentos de decision en CD. Informe técnico presentado a COSUDE - Centro America. CIAT, Cali, CO. 55p.

Zapata, V.;Galvez, G.; Chery, J.; Osmy, G.A. 2003. Progress report and working plan for Haiti 2003. CIAT, Cali, CO. 24 p.