

**CN 132 – Payment for environmental services
as a mechanism for promoting rural
development in the upper watersheds of the
tropics.**

Proposal for Andes Basin

Submitted to: Challenge Program on Water and Food

By: GTZ-CONDESAN (Cuencas Andinas Project), CIAT, DIIS

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TABLE OF CONTENTS

PROPOSAL

CURRICULUMS VITAE

POTENTIAL ENVIRONMENTAL IMPACT OF THE PROJECT

GANTT-CHRONOGRAM

BIBLIOGRAPHY

BUDGET

OTHER DATA

SUPPORT LETTERS

PROPOSAL

CN132: Environmental services promoting rural development

Project title	5
Brief title.....	5
Executive summary.....	5
Institutions participating	6
Project leader (PL)	6
Principal investigators - (PIs).....	6
Budget requested from CP (in US\$).....	7
Duration of project.....	7
Coverage of basins	7
Coverage of themes.....	8
Background and justification (755 words)	8
Specific objectives (149 words).....	9
Activities and methodology (2663 words)	10
Roles of project researchers and institutions (99 words)	15
Outputs (544 words)	15
Beneficiaries and impact (183 words)	16
Assumptions and risks (92 words)	16
Monitoring and evaluation plan (95 words)	17
Dissemination strategy (510 words)	17
Resources needed (22 words).....	17
Responses to panel recommendations.....	17
Annexes.....	21

Project title

Payment for environmental services as a mechanism for promoting rural development in the upper watersheds of the tropics

Brief title

Environmental services promoting rural development.

Executive summary

The Andean mountains contribute to the quality of life in the surrounding cities and ecosystems by providing environmental services and amenities. However the welfare of the rural populace in the region has declined significantly over the last decade. The price of agricultural products has decreased and so have investments in the rural sector. This has led to high levels of un- and underemployment. Research conducted within this project aims to analyze the social and environmental externalities generated by changing land use patterns in the mountainous regions in order to explore, and thus provide a basis for policy decisions on, whether payment for environmental services (PES) and subsequent local investment may prove an effective mechanism for generating dynamic development in the rural sector.

The project will be executed by 20 researchers, from national and international centers and private institutions, who are considered by the partners of CONDESAN to be leaders in priority research areas in Latin America. The researchers will work in four carefully selected pilot sites that are associated with ongoing development projects.

The research focuses on:

- A biophysical analysis of the watershed to describe the behavior of the Hydrologic Response Unit (HRU).
- Quantitative analysis of the environmental and social externalities based on water balances, greenhouse gas balances, , and the physical and economic productivity of the production systems.
- Prioritization of the HRU by means of analysis of several distinct scenarios for land use, selecting those that provide positive potential impact in productivity and environmental externalities.
- Development of novel means of participation to analyze asymmetries in both the use of and access to natural resources and also the exercise of power and authority. This analysis will improve the implementation of PES and the land use planning.
- Creation of integrated economic platforms by means of strategic alliances between producers, government agencies and the private sector, and focusing on making the poorer producers more competitive.

- Evaluation of limitations to this approach quantifying the economic benefits by using the externalities as the engine for development.

The W&FCP will provide 32% of the total resources needed to execute the project. The remaining 68% will be provided by local organizations. The 31% of the counterpart resources will be invested in activities promoted by strategic alliances and playing a critical role in determining the dynamics of externalities in the development of the watersheds.

Institutions participating

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See Annex (Other Data) for full list of principal investigators involved in this proposal.

Budget requested from CP (in US\$)

\$ 482601

Budget offered as matching funds (in US\$)

\$ 1016200

Total budget (in US\$)

\$ 1498801

Duration of project

2 ½ years

Coverage of basins

Andes Basins

Coverage of themes

Crop Water Productivity Improvement (Theme 1)	0%
Multiple Use of Upper Catchments (Theme 2)	60%
Aquatic Ecosystems and Fisheries (Theme 3)	%
Integrated Basin Water Management Systems (Theme 4)	23%
Global and National Food and Water System (Theme 5)	17%

Background and justification (755 words)

Payment for the production of environmental services is, in theory, one of the few mechanisms left through which hillside zones can combat current problems such as low agricultural prices, agricultural subsidies in developed countries, high rural underemployment rates, high levels of extreme poverty and degradation of the natural resource base. By making agricultural production viable and allowing profits to be captured locally, payment for environmental services schemes can have an impact on land use, food security and rural welfare.

Winpenny (1991), recognize that the inclusion of environmental externalities in the basin analysis will facilitate an effective estimation of the environmental degradation costs. A series of studies demonstrate the significance of land use on erosion, water retention in the soil, sequestration of carbon and other greenhouse gases and natural disasters in Andean countries (Torres, 2001). Though the cost of environmental degradation is not considered in national accounts, its value has been estimated at 5% of the Andean agriculture PIB (more than 1.5 billion/year). Preliminary estimates (Estrada 2002) show that when hydrological externalities are included, this amount could reach USD 1 billion/year for Colombia alone. These values are consistent with the results of studies from other parts of the world (Winpenny, 1991; Bojo, 1987; Bishop and Allen, 1989; Brooks, 1982).

These research is focused on quantitative analysis of hydrological externalities due to lateral flows process and run-off peaks. . Climate change is affecting the amount of water in upper watersheds. For example, in several Andean basins Andean glaciers provide 60% of water used for agricultural production. The Andean region has more than 80% of the tropical mountains with glaciers; climate change and volcanic activity are contributing to glaciers reduction. Some studies estimates that in 40 years these glaciers will disappear from the tropical mountains in Latin American. In Peru, 20% of the glaciers area has diminished in the last 20 years (Gonzales, 2003).

Payment for environmental services is becoming an important topic in the Andean countries. Between 1994 and 2000, more than 5 million families spent over 140 million dollars on investments in watersheds that generated environmental externalities, the majority related to water and soil erosion (Contraloría General de la Republica, 2002). Though resources are available, the process of resource allocation has serious limitation, mainly related to the analysis and prioritization of actions that guarantee:

- 1) That investment is made in areas with high potential for externalities.
- 2) That the agreed upon impact are achieved

- 3) That payments represent a transfer of resources rather than a subsidy, and
- 4) That over time the benefits generated by payments are captured directly or indirectly by local producers, especially the poor.

In the Andes basins, quantitative analysis of externalities adds value to the scientific research when complemented with development projects, due mainly to its impact on rural development. Many research and development projects have produced tools and methodologies. However, the link between productivity, degradation costs, equity and sustainability are not clear in these approaches leading to a weak prioritizing of actions and strategic alliances. The understanding of these interactions will allow identifying better investment opportunities for public and private sector and will oriented the strategic regional planning. Externalities analysis has not been included as part of land use and development plans formulated by governments. This fact has limited the incorporation of new finance sources that will improve the livelihood of rural population where the income from agriculture has decreased due to the international subsidies.

Basin analysis in representative ecosystems followed by investment in pilot case study sites will provide a continuous validation process of techniques and methodologies. This methodological strategy will provide an opportunity to demonstrate the potential of the externalities in the development process of a region, being a collective learning chance.

The hypothesis of this research is split in the following four sections through which substantial changes in the dynamics of development for the Andes can be achieved. The first is that the magnitude of the environmental and social externalities will re-establish viability to agricultural production, and thereby contribute to a reduction in the economic and social problems in the eco-region. The second is that systematic analysis of externalities is the best way to add value to ongoing research and development activities, and to empower communities to achieve political change. The third hypothesis is that the economic and political environment is propitious to achieve partnerships between small farmers and entrepreneurs to make them more competitive. Finally, given the complexity of the analysis and process, functional cases are required in which researchers, technicians, producers and politicians jointly evaluate the potential of different alternatives.

Goal (57 words)

The goal of the project is to alleviate poverty and enhance sustainability in upper catchments by increasing the flow of resources from governments and civil society to poor rural producers, reducing the negative impact of environmental externalities and strengthening the competitive capacity of the poor through greater food security, higher incomes, and better administrative and organizational skills.

Specific objectives (149 words)

To achieve the main goal, existing local organizations and networks need to be strengthened via the formation of a partnership between international and national researchers, development projects, local politicians, entrepreneurs and farmers to respond to the following objectives:

- 1) Demonstrate the potential and feasibility of payment for environmental services schemes to reduce poverty

- 2) Generate information and processes as the basis to form strategic alliances between public and private sector.
- 4) To propitiate rural investments by means of strategic alliances sponsored by local platforms composed by a wide range of stakeholders.
- 5) Change in land use dynamics as a result of internalization of environmental externalities.
- 6) Impact on the target population through the generation of a land use dynamics and new policies by the research project.
- 7) Identify other Andean basins for results extrapolation.

Activities and methodology (2663 words)

Output 1. Basic Information and main hypothesis to project intervention

Secondary biophysical, socio-economic and institutional information will be systematize for each watershed in order to provide a basis to formulate hypothesis about the relation between land use, land management practices and natural resource management with the levels of environmental services supplied to users.

Previous experiences about environmental services surveys or mechanism will be analyzed to provide guides about causes of failure or successful that should be account for EPS design in the watersheds of this proposal.

Output 2. Identification and valuation of environmental externalities

Determination of hydrological balances and carbon sequestration

- a- Characterization of catchments. Characterization of the 4 catchments divided into sub-catchments and hydrological response units (HRUs) by overlapping maps of land cover, soils, elevation models, and precipitation using the methodology presented by Neitsch et al, 2000.
- b- Hydrological balance in the UHR. Quantification of stream flow, water retention in the soil, lateral flows, evaporation potential, actual evaporation, aquifer recharge, contribution to stream level and erosion via interfaces between ARCVIEW 3.1 y Soil Water Analysis Tools (SWAT). Methodology in Neitsch et al, 2000
- c- Validation of hydrological models through measurement of daily stream flow and rainfall simulator to verify in the field levels of infiltration, water retention in soil, peak flow and sediment concentration (Neitsch et al, 2000, Torres, 2001 y Meyer, 1988)
- d- Quantification and valuation of marginal changes in environmental externalities through determination of stream flow, water retention in the soil, lateral flows, evaporation potential, actual evaporation, aquifer recharge, contribution to stream level and erosion under different land uses and management practices scenarios via interfaces between ARCVIEW 3.1 y Soil Water Analysis Tools (SWAT). Methodology in Neitsch et al, 2000
- e- Preliminary prioritization of Hydrological Response Units (HRU) according with the previous quantification and valuation of changes in environmental externalities.

- f- Methodologies to Assess Carbon Stocks and Fluxes of Greenhouse Gases: Biomass assessment will be done through allometric equations for trees and shrubs and by harvesting representative subplots of crops and pastures. Allometric equations will be developed for selected species when not available (Feldspaucsh et al, *in press*). C in soils will be measured down to 50 cm depth using trenches. Bulk density will be measured both by the replacement and fixed volume cylinder methods to assure a reliable assessment of this key parameter. Soil organic carbon will be measured by wet digestion (Oxidable Carbon) method and also by high temperature dry combustion (Total Carbon). In areas where the history of land conversion from C3 type dominated vegetation (i.e native forest) to C4 dominated species (some grasses, maize, sorghum etc), or from C4 into C3 vegetation, is well known and reliable, ¹³C determinations will be made in soil samples to assess the rate of replacement of new organic matter and to establish C partitioning between soil pools of different mean residence times (Baledescent et al, 1998).

Greenhouse gases: Fluxes of carbon dioxide, methane and nitrous oxide, the three most important GHG related to land use change and agricultural activities, will be monitored on an annual basis to follow at least a full cycle of climatic variations. The closed vented chamber method will be used (Hutchinson and Mosier, 1981). Gas samples will be stored in pre-evacuated glass vials and will be analyzed within two wells after collection by gas chromatography (ECD and FID detectors) for CH₄, CO₂ and N₂O. Soil water content will be measured at every sampling time by TDR techniques. Soil Redox potential, pH and soil temperature will be measured *in situ* and soil samples will be collected periodically for monitoring ammonium and nitrate levels.

Output 2. Identification and valuation of environmental externalities

Output 4. Socio-economic analysis

g- Ex ante economic analysis to value environmental externalities

- Quantification of productivity and profitability of different production systems and their impact on hydrological balances.
- Incorporate the analysis of the HRU changes into production systems, identify change in production systems, and analyze their technical and economic evolution through analysis of economic, social and environmental costs and benefit scenarios.
- Quantification of shadow factors prices using optimization models based on physical and biological characteristics of the HRUs, level of production of the different systems and market prices for products and labor.
-
- Ex ante analysis of alternatives considering different levels of value added: The economic efficiency of each alternative will be assessed considering the shadow price of resources and tradable goods, shadow prices of non-commercial goods and linkages to employment generation. Methodology: For levels of investment and distribution of benefits based on achievement of social and environmental goals as measured by indicators (Estrada and Posner, 2002; and for linkages methods, De Janvry and Glikman, 1991).

Output 3. Risk analysis for natural disasters.

The risk analysis will be focused on threats by droughts and frosts that have an impact on farm productivity. In the way to propose alternatives that are economically feasible it is required to determine crop productivity under the influence of this climatic phenomena.

In Andean mountains, the vulnerability is related with rural wealth. Therefore, is needed to establish production alternatives according with the economic profiles of rural populations and the potential impact of droughts and frosts. Climatic changes impact is determined with an expert system that regards the effect of precipitations and temperature variations on productivity (Arce 1991).

Threat analysis will be conducted for the already identified URH's. For each prioritized URH the probability of droughts and frost incidence will be calculated as the economic vulnerability according with socioeconomic factors of farmers.

This probability is achieved by an existing relation between minimum nocturnal relative humidity of a day before and the minimum temperature of the following day (Vacher 1988, y Le Tacon 1989) with the occurrence of frosts. This impact analysis adapted to URH will permit to cover the environmental heterogeneity that characterized the Andean region.

Droughts effects will be determined by using daily precipitation as basis to estimate real evapotranspiration according with water availability in soil and the total of rain water accumulated in each crop phenologic stage.

Output 4. Socio-economic analysis

a- Establishment of a base line of quality of life based on local perceptions. The principle steps are:

- Site selection,
- Classification of well-being within the community,
- Clustering of households in well-being categories,
- Quantification of well-being indicators,
- Development of well-being indices,
- Validation of internal and external logical of indices, and
- Creation and use of a poverty profile. (Ravnborg et al. 1999)

b- Selection of the target population in different catchments.

On the basis of census data and surveys, evaluate how poverty changes in the face of different scenarios of resource use and the impact it would have on land use, productivity levels, macroeconomic measures and employment generation. Select 100 families per catchment to assess impact.

Output 5. Institutional analysis

a- Stakeholder identifications and analysis will be carried out in each of the study catchments. Substantial amount of information is already available, however it is key to have a clear understanding of who the target audience is and to involve them in the research and development process from the beginning. This analysis will use a method for stakeholder identification and analysis for collective action in natural resource management developed by Ravnborg and Westermann (2002). The methodology is based on individual interviews and group sessions. The former reveals personal concerns regarding natural resources management and identifies contrasting perceptions. The second exposes disagreements and disapproval of resource use by others and develops a group perception of problems associated with natural resources management and identifies the benefits of collective action.

The institutional analysis will be consider the Andean basins asymmetries in both the use of natural resources and also the exercise of power and authority. This analysis will be useful to design and implement investment plans. The stakeholder analysis tools will be adapted to:

- Identify key stakeholders in watershed NRM, their priorities and interests, their relations to one another, issues contributing to conflict/cooperation, and stakeholder priorities for improving NRM. Determine which stakeholders should and want to be involved in PM&E, and their expectations.
- Characterize social capital and collective action – by whom, for what, short/long-term, (dis) incentives, and perceived impacts.
- Characterize conflicts – by whom, over what, and perceived impacts, esp. with respect to collective action.
- Diagnose power relations.

b- Experimental economics

This study will adopt the results of stakeholder and externalities analyses to understand La Miel Basin different socioeconomic and biophysical asymmetries, for example, upstream versus downstream users, agricultural versus urban and industrial users. The economic games will simulate the role of collective action, markets and/or external regulation in resource management.

Experimental economics has been applied to examine the role of self-governance and the surrounding institutions (rules) on CPR (Ostrom et al. 1994). The proposed approach is to conduct economic games analysis with stakeholders to comprehend the individuals' behavior that orient their decision-making and affect the individual and group outcomes (Cardenas 2000).

The experimental design will involve different players as producers, local government and private sectors, who make sequence of individual decisions. These decisions will be related with land use alternatives, CPR extraction levels and/or management practices according with the stakeholders and externalities analysis. Results will reflect how natural resources and individual and community welfare will be collectively affected by individual decisions.

Systematic analysis of private and public decision-making will help identify how individual use of resources affects the outcome of others and the long-term availability of natural resources. Research results will facilitate more effective collective and institutional strategies to manage resources.

Output 6. Strategies for externalities internalization - Payment for Environmental Services (PES)

- a- Design strategic alliances of co-investment schemes as negotiation platform
 - Identify potential institutions for implementing Payment for Environmental Services (PES) schemes: Using the result of the biophysical, economic and social analysis, identify potential institutional options (public, private, non-profit) for implementing payment for environmental services schemes. Analysis would focus on efficiency criteria (e.g. incentives of both buyers and sellers, on transactions costs of alternative options) and equity (how are benefits distributed) (McCann et al, 2002; Colby and d'Estree, 2000; Escobal, 2000)
 - Integration of entrepreneurs, producers and local authorities by means of interactive processes. The results of externalities analysis and ex-ante analysis of land use scenarios will be consider in the application of "Think Tools" (<http://www.thinktools.com/>) models to develop agreements of production, commercialization and profits and losses distributions according with the different income levels.
- b- Feasibility analysis of investment alternatives and establishment of enterprises

Formation of producers associations, based on indicators of social and environmental impact. Credit sources, local businesses, and contracts types will be studied on pilot watersheds, to create business that are proficient in production, financing and marketing with an effective distribution of income among the partners.
- c- Design of new co-funding schemes, PES and guarantee funds.

According with the community priorities and the social and environment benefits identified through ex-ante analysis, the shadow prices of the resources will be use to design co-funding systems which will guarantee that the resources will be transfer rather than becoming a subsidy. In Colombia, the experience showed the significance of guarantee funds on the private sector to form alliances with the poorer. In order to achieve this, the guarantee values will be estimate according with the social and environmental benefits that could be generated.
- d- Implementation of a pilot PES mechanism through consolidation of strategic alliances and creation of enterprises. Use of information and farmers partnerships to achieve agreements for participation, efficiency indicators and benefits distribution. Think tools will be considered as the basic tool for this.
- e- Develop monitoring and evaluation system: The systems will be implemented simultaneously with the co-investments schemes so that the implementation process can be assessed and mid-course correction made, if necessary. It will also help measure the actual and potential impacts of the co-investment schemes on project's target populations.
- f- Analysis of early adoption of land use changes through the enterprises implementation. Though the brief period of time since the enterprises and land use changes are implemented, the business experience and the biophysical behavior of these HRU will be used to selected new similar HRU and surveys will be done to collect perceptions of others potential producers. Incorporation of new alternatives in others sites will depend on possible limitations noticed by these producers.

Output 7. Lessons and recommendations

a- Policy recommendations and decision support tools will be developed based on the lessons of the project. A geo-referenced information system that allows comparisons and dissemination of information about watersheds to universities, research institutes and decision makers. A geo-referenced database will be developed in order to use the information generated in the previous analysis. A local server will be required to support the analysis and data dissemination. An interactive CDROM tool will be release using Map Object (ESRI) to integrate the biophysical and socio-economic information useful to prioritize the HRU.

b- Identification of watershed characteristics to determine other Andean sites for early extrapolation.

The results of the previous analysis will lead to a better understanding of possible modifications on HRU's in the Andean eco-region. These modifications will reflect the influence of different site-specific environmental context and macro economic variables.

In order to extrapolate this analysis-action methodology, other Andean basins will be selected based on the significance of the efficient water use on the PIB of the region, and the feasibility of modify incomes through a change in the water use for livestock and agriculture. The presence of development projects in certain sites will be important in the selection process in order to promote the strategic alliances between entrepreneurs, farmers and local governments.

Roles of project researchers and institutions (99 words)

Table 1 shows the full list of participants in the current proposal together with the fields of expertise from which contributions are expected. Researchers come from social, economic and biophysical backgrounds. Their participation is focused on specific topics and at different times in the course of the implementation of the project (See annexed Gantt chart of teams in charge of different activities). Collaborators team support individual researchers. They can bring research questions to be discussed in groups when needed. CONDESAN has previous experience in working with the most of them both as individuals and as small teams in similar project in the Andes. The leading experience of CONDESAN with the GTZ are a plus in coordinating inter and multi disciplinary research and development teams.

Outputs (544 words)

Each one of the outputs are related with a series of key research questions (see research priorities in the Andean catchments) that must be answered in an integrated way in order to achieve impact. To answer these questions, small groups will be formed consisting of researchers, development workers and others. The initials in parenthesis following each activity in the flow chart of activities are those responsible for producing that output (See Annexed Principal Investigators Table).

1. Basic Information and main hypothesis to project intervention
2. Identification and valuation of environmental externalities
3. Risk analysis for natural disasters.
4. Socio-economic analysis
5. Institutional analysis
6. Externalities internalization strategies - PES
7. Lessons and recommendations

Beneficiaries and impact (183 words)

Four pilot catchments (Fuquene (Colombia), Ambato (Ecuador), Jequetepeque (Peru), and Tunari (Bolivia) and around 20 municipalities in these catchments.

More than 20 institutions (NGOs, NARES, Universities, development projects) that are currently integrated into the activities of CONDESAN and participate in research and development activities in the catchments.

Approximately 20 national and international technicians working together to generate and adapt methodologies, tools and approaches to respond to concrete needs of development projects.

Agricultural development banks in the Andean countries, via the evaluation of the performance in pilot catchments, will be able to make more efficient use of resources by integrated them into environmental services schemes.

Environment ministries and authorities in the Andean countries that are involve in the process of developing efficient systems for prioritizing action in catchments.

More than 300 direct beneficiaries and 500 indirect beneficiaries that participate in the business that are established.

Assumptions and risks (92 words)

The most serious concerns in developing this proposal is the violence associated with some marginalized regions of the Andes. The process of assigning financial resources to invest in production activities due to this violent situation taking longer time that initially planned. In some areas lack of infrastructure can reduce advances in the implementation of some investments. A logical strategy to cope with social constraints is to involved local researchers who know better the conditions of each place, together with an open local participation that facilitates interventions. This can warranty that risks associated with the implementation of the project will be minimal.

Monitoring and evaluation plan (95 words)

Several of the project activities and outputs have programmed self evaluations needed to continue in the research and development process. This process will be facilitated by means of verification of each 22 milestones (see annexed tables). These internal evaluations will be the raw material for external reviewers that are considered for the 14th and 30th months of the project. In addition to this, in December 2004, GTZ will have an external evaluation to the watershed project, which is also part of this proposal. It has been considered that that evaluation will be available to the Water and Food Challenge Program reviewers.

Dissemination strategy (510 words)

CONDESAN already has in place a system for scaling up based on the 11 pilot catchments (validation and early extrapolation), 60 satellite catchments and 5000 HRUs. In each pilot catchment there is a round table to reduce duplication of effort. In the validation catchments, the methods tools and approaches are tested for their potential to have impact. The best bets of this proposal will be able to extrapolate, through future projects, to the "early extrapolation" and satellite catchments. This information also serves as the basis for action through development planning. At the final of this project, other catchments will be selected where future research has the most potential to achieve impact. With this scheme, a constant feedback is guaranteed to identify the effects of agro climatic and socio economic conditions at the level of the eco-region.

In the second year, strategic investment partnerships will be established in the selected 4 pilot catchments based on the results of the analysis of the potential of externalities. It is expected that 2-5 businesses will be established in the second and third years.

All information generated will be disseminated via Infoandina (CONDESAN's information network) and through training programs and postgraduate level courses at partner universities.

Resources needed (22 words)

Detail of resources needed appears in the section describing activities and methodology. This is also complemented with information contained in the budget.

Responses to panel recommendations

- Need to clarify the link between quantification of environmental externalities and the distribution of economic benefits to local stakeholders.

Sedimentation problems decreased of water supply in the dry season and greenhouse gases effects must be analyzed as costs that should be paid for the society. Few studies have

focused on the causality relationship between the farm activities and the generated externalities. The quantification of the externality magnitude, the spatial identification where it is generated and who are affected for are required to start a negotiation process where the society, including the affect community, should finance it.

In most of Andes basin, these process means a significant magnitude (approximately 8-10% of agricultural PIB) due the agro ecological and climatic conditions and is feasible to promote a land use change in order to modify the externalities.

Through the basin analysis methodology explained this project will be able to identify the areas where a land use change could increase the incomes of poorest due to a higher agricultural production, payment for environmental services mechanisms or feasible relocation of poorer labor where other land uses require it.

Without a quantification of the externality magnitude and the establishment of causality relation are impossible stimulate a resource transfer from the society affecting the local economy and the poorer development.

- Explain the logic behind using shadow prices.

In the countries of the Andean region the governments stipulate a minimum wage rate paid to people under a work contract. The economic analysis done by projects use the market price and consequently the daily labor cost are established based on the minimum wage.

In the last decade, the unemployment rate has reached 20% and sub-employment 40% and the agricultural production has decreased. Consequently, the minimum wage is higher than the real labor retribution actually received by rural workers. Thus, the use of the minimum wage rate leads to evaluate alternatives with two consequences: the agricultural and environmental alternatives are not profitable enough to be implemented due the high labor cost, and second, the profitable alternatives are the ones that employ less labor that not cover the social demand and prefers the increment of the use of machinery.

In the poor rural sector of Latin America the farmers work for themselves without work contract and in many cases their labor is sub-employed due the farm size. Under this situation, the opportunity cost of labor is not related with the minimum wage. CONDESAN studies have found that this cost could be less than 50% of the minimum wage.

The shadow prices of labor lead to identify investment opportunities under a more realistic condition. In this analysis is considered the quantification of labor employed and the market prices in the national and international context. Some experiences have shown under this approach that it is possible to duplicate the income of the poorest percentile even with labor retribution smaller than the diary minimum wage.

For many environmental services there is not a transaction price and the process to stipulate these market prices is imperfect because they are fixed by political agreements at national levels (for example, water prices). Therefore, these values applied by the authorities do not cover the real price that society should pay for.

Consequently, under these prices is impossible to modify the land use in order to promote a resource transfer from the society to the producers, from the cities to the rural sector. The application of realistic prices with an appropriate resource distribution by the society could be reached by means of shadow price analysis.

- How will the co-investment scheme work in practical terms?

The project will have about \$US 1.000.000 for a "risk fund" to stimulate entrepreneurs to make investments where they would not do it under just economic profitability conditions. The risk fund will be established based on CONDESAN experience with small funds (Estrada, R.D. and Posner, 2003, which work under certain rules to ensure the achievement of the social and environmental goals. Some of these rules are:

- This fund can invest in projects selected by their impact on social and environmental externalities. The investment is not oriented to support projects to increase the agricultural production in only specific sites that used to be attended by other development projects.
- The risk fund invests no more than 30% of the total to guarantee that entrepreneurs and producers will also invest. The amount of the risk fund investment is calculated based on the environmental and social changes that could be obtained and also that will affect the poorest percentile (employment for women, child education, etc.).
- This fund could be managed in a flexible manner and it could serve as a guarantee to promote inversion by developments banks and local governments with the poorest percentile, which would not occur under current conditions.
- The existence of agreements between partners will determine the funds use and how the losses will be assumed in case of business failure.
- The benefits generated by these businesses will be returned to the risk fund.

- How will the establishment of local enterprises ensure that at least 70% of the benefits are to be captured by the poorest?

Preliminary evaluation of local business potential to generate positive environmental externalities and rural employment for poor populace will lead to determine the project feasibility based on certain desired goals and consequently the risk fund investment. The previous basin analysis will be used to design local businesses in order to achieve these goals. During the establishment of the strategic alliance a benefit distribution is specified and this system is structured to ensure that the 70% of benefits will be captured by poorest percentile. It can be guaranteed because the proposed enterprises will just receive the profits needed to achieve a 10% annual return on the invested capital. The benefits left are generated when poorer laborers are employed where employment opportunities are scarce. Additional benefits could be obtained due employment chains generation in both ways, forward and backward. These benefits are not usually accounted in most profitability analysis.

- A significant opportunity that will require precise definition (for example, is payment a general solution or specific to a given set of conditions).

Payment for environmental services implies some issues. In most cases these payments become subsidies and not a resource transfer between different sectors. If the payment is perceived as a subsidy (the producer benefit capture is greater than the value provided for environmental externalities due the land use changes), the business is not appropriate for the society and it could not be sustained in the long term. In another way, when the payment is a resource transfer (the producer benefit capture is less or equal than the value provided for environmental externalities due the land use changes) the mechanism is

sustainable and will benefit society by means of net incomes increment of the overall system.

The purpose of the project is identifying those cases where the investment would be a transfer. To achieve this goal it is required to understand the specific conditions leading to a success of the economic mechanism.

- How sensitive will Hydrologic Response Units (HRUs) be to slow variation, e.g. GCC?

A cover, a soil type, a slope and certain precipitation level integrate the Hydrological Response Unit. What would modify the HRU behavior are the precipitation levels and consequently is needed to establish how sensitive is the precipitation to the variations caused by Global Climatic Change. It is known that GCC would increase extreme weather phenomenon's by higher precipitation or longer dry periods. It would affect some HRU such as the ones located at the south Andean region with low precipitation and incipient land cover and where also currently exists extreme variations in mean precipitation within the same site (e.g. between 400 and 3500 mm/yr)

- Not clear how the Nile work will fit in equally well with HRUs under different landscape types?

The extrapolation process is though to apply the Andean basin analysis focus and the methodology in the Nile basin. Hydrological balances will be determined for HRU in the upper Nile watersheds. Subsequently, externality analysis will lead to identify their magnitude in order to prioritize the basin where the overall CONDESAN methodological scheme will be applied. Nile basin researchers would have a previous chance to participate in Andean studies with similar issues as efficient water use for livestock and food production. These researchers will know the CONDESAN methodology through involving them in these studies and consequently they will be able to apply it at the prioritized Nile basin. In addition, the Andes basin system researchers could visit the African basin to recognize its conditions in order to solve together technician and administrative issues in the Nile and adjust the methodological approach.

- How sensitive are payment schemes to uncertainties introduced by modeling?

Modeling is an approach to quantify the environmental externality magnitude and causality. To reach accurate results a validation process of model is done through direct flow measures, rain simulators, greenhouse gas base line, etc. Payments for environmental services are negotiated based on this approach, which look forwards recognition of environmental externalities and quantification of magnitude payment. This is required to promote new profitable alternatives through land use changes, even when the initial payment is less than the best compensation that could be obtained through a specific land use implementation.

In the most current PES mechanisms the prices are determined through political agreement. For example, in Colombia the hydroelectric business transfers 6% of net sales to the watershed (Estrada, R.D.; Quintero, M. 2003)

The payment scheme sensibility depends also on the externality, which is evaluated. Currently, the water and erosion approach is more consistent than the greenhouse gases one. In general, the project theme has an early development but along the process new methodological adjustments will rise to improve the approaches.

- Process of business development will need to be clarified.

The business development is based on six elements:

1. Information: Previous measures and evaluation models will be made. It will provide specific information about the cost and benefits derived from this process.
2. Strategic alliances: Institutions and entrepreneurs that believe in this kind of investment are integrated. Thus, the analysis will consider environmental and social aspects in a rational economic manner.
3. Feasibility analysis: The biophysical behavior and the cost and benefit analysis must be considered in the feasibility studies. The benefits captured by different partners (producer, entrepreneurs and local governments) will be recognized.
4. An economic stimulation system: For alliances that promote profitable alternatives with positive impact on environment and social context, an economic stimulation will be given by the co-funding system and risk funds.
5. Agreement for failure business: As the efforts are focus on incorporation of community in the alliances, previous agreement is done to determine in case of failure how possible losses will be assumed between partners.
6. Enterprise alternatives: There is not a predefined enterprise type. This is determined along the process according with the environmental, social and economic site specificity. All the enterprises promoted will modify the externality by having an impact on generation of rural employment and land use change.

Annexes

CURRICULUMS VITAE

- CV Edgar Amézquita
- CV Rubén Dario Estrada
- CV Alonso Moreno
- CV Helle Munk Ravnborg
- CV Jorge Rubiano

Support letters

- IIS
- GTZ
- CONDESAN
- CIAT

BUDGET AND OTHERS

- Flow chart of activities
- List of principal investigators
- Budget according to template
- Potential Environmental Impact of the project.

CURRICULUMS VITAE

CURRICULUM VITAE

Edgar Amézquita

Name: Amézquita
First name: Edgar
Year of birth: 1944
Nationality: Colombian

Key Qualifications

Edgar Amézquita is a soil physicist working at the International Center for Tropical Agriculture (CIAT) in the soil's project in aspects related to the management of soil physical constraints and soil improvement in tropical savanna soils and in climatic factors affecting soil water infiltration, run-off and soil loss in Hillsides environment in volcanic and non-volcanic soils. He has contributed to the development of soil management concepts that are being applicable for both savanna and hillsides environments seeking agricultural sustainability. He has also been working in the design and construction of different apparatus and tools for evaluating soil physical conditions and susceptibility of soils to erosion and rainwater runoff.

Education

1970 B. Sc. (Soil science) Universidad de Nariño, Pasto, Colombia.
1974 M. Sc. (Soil and water conservation) IICA-CATIE. Turrialba Costa Rica.
1981 Ph. D. (Soil physics) University of Reading, Reading, UK.

Positions Held

1994 Soil Physicist, Centro Internacional de Agricultura Tropical (CIAT) , Cali. Colombia.
1986-1994 Leader of the National Natural Resources Program of ICA (Colombian National Agricultural Research Institution)
1981-1986 Leader of the soil and water Division of Cagua Experimental Station. Venezuela.
1975-1977 Leader of the soil and water Division of Cagua Experimental Station, Venezuela.
1970-1972 Lecture in soil science in Tolima University, Ibagué, Colombia.

Selected Publications

Amézquita E., Thomas R.J., Rao I.M., Molina D.L., Hoyos P. 2003. The influence of pastures on soil physical characteristics of an Oxisol in the Eastern Plains (Llanos Orientales) of Colombia. *Agriculture, Ecosystems and Environment* (in review).
Phiri S., Amézquita E., Rao I.M., Singh, B.R. 2003. Constructing an arable layer through vertical tillage (chisel) and crop-pasture rotations in tropical savanna soils of the Llanos of Colombia. *Journal of Sustainable Agriculture* (in press).
Amézquita, E., M. Rivera, D.K. Friesen, R.J. Thomas, I.M. Rao, E. Barrios, and J.J. Jiménez 2002. Sustainable crop rotation and ley farming systems for the acid-soil savannas of South America. Proceedings of the 17th World Congress of Soil Science, Bangkok, Thailand. August 14-21, 2002.
Decaëns T., Asakawa N., Galvis J.H., Thomas R.J., Amézquita E. 2002 Surface activity of ecosystem engineers and soil structure in contrasted land use systems of Colombia. *European Journal of Soil Biology* 38: 267-271.
Thierfelder, C., E. Amézquita, R.J. Thomas and K. Stahr. 2002. Characterization of the phenomenon of soil crusting and sealing in the Andean hillsides of Colombia: Physical

- and chemical constraints. Proceedings of the 12th ISCO Conference, Beijing, China. May 26-31, 2002.
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- Ricaurte, J., Zhiping, Q., Filipe, D., Rao, I.M. y E. Amézquita. 1998. Distribución radicular, absorción de nutrientes y erosión edáfica en sistemas de cultivos y forrajes en laderas del Cauca, Colombia. *Revista Suelos Ecuatoriales* 30 (1 y 2), in press.

CURRICULUM VITAE

PERSONAL INFORMATION

Name: **Rubén Dario Estrada**
Year of birth: 1946
Nationality: Colombian
Languages: Spanish
Email: r.estrada@cgiar.org
Current Position: Leader of Policy Analysis - CONDESAN

PROFESSIONAL PROFILE

1970 B.s.. Universidad Nacional de Colombia. Agronomy

1971 M. Sc. Universidad del Valle. Economics.

Country experience: Colombia, Peru, Ecuador, Honduras, Venezuela, Uruguay, Argentina, Costa Rica, Bolivia.

PROFESSIONAL EXPERIENCE

1997 to present Leader of Policy Analysis. The Consortium for the Sustainable Development of Andean Eco-region (CONDESAN)

Conducted environmental externalities analysis for forty watersheds in the Andean region as a mechanism to reduce poverty.

Proposed a methodological approach to include environmental degradation cost in national accounts.

Analyze the trade off between equity, sustainability and productivity for Andean region.

Conducted pre-feasibility studies for investment projects.

Lead a business fund to promote alliances among entrepreneurs and local producers in Andes basins.

1992-1997 Research Associate. International Center for Tropical Agriculture CIAT – International Potato Center. Hillsides Program.

Conducted specific studies to establish: Relationship between poverty increments, agricultural incomes, and natural resource degradation in the Andes mountain range; the magnitude for environmental externalities in specific basins, quality life assessment through local perceptions, base lines for policy impact assessment, and risk analysis with climatic and economic factors.

1985-1990	Official linked with the Research Program of agricultural systems (Programa de Investigación en Sistemas Agropuecuarios) in Latin America. International Development Research Center (IDRC) of Canada.
1971-1985	<p>Primary responsible for research, transfer and adoption project at Puno (Perú).</p> <p>Research Associate. International Center for Tropical Agriculture. Program of Tropical Pastures.</p> <p>Economic assessment: Adoption and transfer technology impact of new varieties of rice, corn, pastures and yucca.</p> <p>Economic assessment: Distribution of benefits among producers and consumers.</p>

OTHER SELECTED EXPERIENCE

- GTZ Consultant (2002) for Watershed Analysis.
- KFW Consultant for trade off studies between sustainability, equity and productivity factors. 2001.
- World Bank Consultant (2001). Conducted a specific study related with use of private funds for agricultural research.
- BID Consultant (2000) for:

Policy Analysis required in Andean region for rural development and Impact assessment of policies on agricultural system economics.

Validation of methodologies applied for economic incentives in watersheds. Conducted with the collaboration of Environment Ministry of Colombia.

- ILRI Consultant (1999) for Optimization studies required in ex-ante analysis of livestock systems.
- FIDA Consultant (1994 – 1997) for

Determination of strategies to include natural resource management in development projects.

Analysis of water and soil management prioritizing poverty alleviation in South of Peru, Ecuador, Bolivia, Guatemala and Honduras.

- FAO Consultant (1998) for Pre-feasibility analysis for implementation of sustainable production systems in Colombian Andes.

SELECTED PUBLICATIONS

Estrada, R. D. 1994. Experiencias con la delegación de la investigación al sector privado en Colombia. Seminario internacional sobre la modernización de la investigación en el Ecuador. INIAP-GTZ. Agosto 1994.

Estrada, R.D. 1994. Desarrollo de sistemas agrícolas sostenibles para el sector campesino de los Andes centrales de Colombia. FAO.

Estrada, R. D. 1994. Análisis ex-ante del impacto del proyecto "Manejo de aguas y suelos en la sierra sur del Perú" sobre la pobreza y la conservación de recursos naturales. Informe de consultoría.

Walker, T., Crissman, C., Estrada, R., Fano, H., Ortiz, O., Leon-Velarde, C. And Quiroz, R. 1994.

Prospect for agricultural Intensification in the Andean ecoregion. In Sustainable agricultural growth in the major ecoregions of the developing world: Prospects to 2000; Workshop. International Food Policy Research Institute. Washington. November 7-9. 35 p.

Sere, C; Estrada, R.D. 1995. Priorización de la investigación en temas medio ambientales, enfoques utilizados a diferentes niveles de decisión. Ponencia presentada en el segundo Simposio Latinoamericano sobre investigación y extensión en sistemas agropecuarios . Tibaitatá. Santa fe de Bogotá. Noviembre 7 al 9.

Estrada, R.D. 1995. Análisis ex-post de la influencia de algunas variables macroeconómicas sobre la competitividad agropecuaria ,equidad conservación de recursos. En el segundo Simposio Latinoamericano sobre investigación y extensión en sistemas agropecuarios . Tibaitata. Bogotá. Noviembre 7 al 9.

Quirós, R., Estrada, R.D., Leon-Velarde, C. and Zandstra, H. 1995. Facing the challenge of the Andean Zone: the role of modeling in developing sustainable management of natural resources. In: J. Bouma, A. Kuyvenhoven, B. A. M. Bouman, J.C. Luyten and H. Zandstra (eds.). Eco-Regional Approaches for Sustainable Land Use and Food Production. Kluwer Academic Publishers, The Netherlands. pp 13-31.

Estrada, R.D. 1996 Limitaciones y potencialidades del medio natural para el desarrollo de sistemas de producción campesinos en los andes. En Memorias del seminario regional para la promoción de sistemas de producción agrícola sostenible para el sector campesino en los andes Centrales. FAO, IICA, CONDESAN, CIP, OEA. Quito ecuador.181-199.

Estrada, R. D., O. Paladines y R. Quirós. 1996. Pobreza y degradación de suelos en los andes altos a experiencia de CONDESAN. VII reunion de RIMISP. 10 al 13 diciembre. Turrialba. San José de Costa Rica.

Nelson, M.; S. Friedman, R.D. Estrada. 1997. IFAD's Poverty Alleviation Operations for Slope Agriculture in Latin America and the Caribbean: Natural Resource management Issues. Reporte confidencial preparado para Technical Advisory Division IFAD. 120p.

Rios, G. Abad, G. Rivera, B. Estrada, R.D. 1998 Análisis de Opciones de Desarrollo en la Cuenca Alta del Río Doña Juana – Victoria, Caldas, Colombia. Trabajo presentado al Tercer Simposio Latinoamericano sobre Investigación y Extensión en Sistemas Agropecuarios (IESA-AL III). Lima (Perú), agosto 19-21 de 1998,

Estrada, R.D. 1998 Pasos concretos que se están dando para implementar en Colombia la filosofía CONDESAN: el caso del Fondo CONDESAN empresarial. Documento presentado a la Quinta Reunión del Consejo Directivo de CONDESAN (Manizales, noviembre de 1998),

Rivera, B Estrada R.D. 1999. Model for the Empowerment of a local Community by Policy Criteria Trade-Off Analysis. Proceedings for World Symposium. of Association for Farming System Research and Extension AFSRE (Pretoria, South Africa, Nov. 30 – Dec. 4, 1998).

Estrada, R.D. 2000. Las empresas locales de servicios (ELS) como oportunidad para producir un cambio social en el sector rural ecuatoriano. Documento presentado en el taller de Empresas Locales de Servicio realizado en Quito marzo 15-20.

Estrada, R.D. ,Holmann, F. Posada ,R. 2000 Agricultural research private funding .The Colombian Experience. Symposium of Agricultural Research Funding. XXIV Conference of International Association of Agricultural Economist, august 13-18. Berlin, Germany.

Estrada, R.D. 2000. Socializando el análisis de cuenca para mejorar el manejo local de los recursos naturales. Programa de manejo de recursos naturales, ministerio del medio ambiente. Convenio MINAMBIENTE.-ICFES-SECAB . Publicación CONDESAN 5/2000

Estrada, R.D. Posner J. 2001. El fondo CONDESAN empresarial. Alianzas estrategicas para atacar la pobreza y la degradación ambiental en los andes. Publicación CONDESAN. 48p.

Estrada R.D. et all.2001. Socializando el análisis de cuenca para un mejor manejo de los recursos naturales. CD-ROM del Ministerio del medio ambiente de Colombia y CONDESAN. Estudio detallado de 33 cuencas en los andes colombianos.

Estrada ,R.D Posner, J. 2001. The Watershed as an Organizing principle for research and development: An evaluation of experience in the Andean Ecoregion . Mountain Research and Development. 21:(2) 123-127.p.

Estrada, R.D., Quintero, M., Pernet, X. & Giron, E. 2003. “Estimación de impacto de desastres causados por heladas y sequías en los sistemas productivos y en las externalidades ambientales de las cuencas andinas” Seminario Taller “Revisión Y Valoración De Experiencias En Análisis de Riesgo” Piura - Perú, 3 a 5 de junio 2003

Estrada, R.D. Y Quintero, M. 2003. Propuesta Metodológica para el análisis de cuenca: Una alternativa para corregir las deficiencias detectadas en la implementación de pago por servicios ambientales. Congreso Latinoamericano de Cuencas Andinas. Septiembre 2003. Arequipa. Perú.

Estrada, R.D. Y Quintero, M 2003. El agua: elemento fundamental para generar una nueva dinámica de desarrollo rural. Seminario Internacional El Mundo Rural. Transformaciones y perspectivas a las luz de la nueva ruralidad. Pontificia Universidad Javeriana. CLACSO. Bogotá octubre 15 al 17 de 2003.

Estrada, R.D., Quintero, M., Pernet, X. y Girón, E. 2003. Valoración de las externalidades ambientales :metodología implementada por CONDESAN en cuencas andinas. Congreso Internacional de ACODAL . Cali 27-29 de octubre.

Estrada.R.D. 2003. Incorporación de la depreciación de los recursos naturales en las cuentas nacionales. Una primera aproximación basada en los análisis por unidad de respuesta hidrológica. Conferencia magistral . Congreso latinoamericano de cuencas Andinas . Arequipa, Perú.

Resume

Name: MORENO DIAZ, Guillermo Alonso
DOB: May 30, 1948
Place of birth: Chiquinquirá, Colombia.
Languages Spanish, German, English

A. Areas of interest:

Agricultural policy; Curriculum development; Natural resource management (including basin management); Development and training of human and social capital; Regional planning; Project planning, implementation and assessment; Strategic planning; Institutional development; Moderating (ZOPP and Think Tools seminars); Agricultural marketing; Rural extension programs; Impact monitoring.

B. Education:

1981-1982 Master's level specialization in University Planning and Administration. Asociación Colombiana de Universidades, ASCUN, Bogotá, Colombia.
1973-1977 Master's and Doctorate studies and PhD in Agricultural Sciences at Berlin Technical University, Germany.
1966-1970 Studies and degree in Agricultural Engineering at Universidad Pedagógica y Tecnológica de Colombia, Tunja, Colombia.
1955-1964 Elementary and high school in Colombia.

C. Work Experience

- Secretary of the School of Agriculture at Universidad de Tunja, UPTC, Colombia. 1971-1972
- Founder and Director of UPTC Headquarters in Chiquinquirá, Colombia 1973.
- Director of the Agricultural Economics Department of the School of Agriculture at Universidad de Tunja (UPTC), Colombia. 1978-1980
- Vice-Rector of Research and Extension at Universidad de Tunja (UPTC) 1980/81
- Founder and Director of the Agricultural Research Institute at Universidad de Tunja (UPTC). 1982.
- Visiting professor at the Social Economics Institute of the Berlin Technical University. August 1982-August 1983.
- Director of the Department of Agricultural Economics and Coordinator of the Cooperation Agreement between Berlin Technical University and Universidad de Tunja (UPTC), Colombia. 1983-1985.
- Dean of the School of Agriculture at Universidad de Tunja (UPTC), Colombia. 1985-1988 (May)
- University professor in the areas of Agricultural Marketing, Agricultural Policy and Project Planning and Assessment. 1977-1996. Universidad de Tunja (UPTC),

Corporación Universitaria de Boyacá in Colombia and Escuela Agrícola Panamericana, Zamorano, Honduras.

- Advisor for more than 30 dissertations (professional and master's degrees) and 8 PhD dissertations in the fields of Agricultural Marketing, Agricultural Policy and Institutional Development.
- Main GTZ Advisor for the "EAP – Fed. Rep. of Germany" Project at the Escuela Agrícola Panamericana, Zamorano, Tegucigalpa, Honduras.
- Main GTZ Advisor for the PROAPA Project, "Consulting for the Agricultural Planning Office" of the Ministry of Agriculture of Peru.
- GTZ Sector Coordinator for Rural Development, Peru (12 projects). June 1997 – July 2001. Member of the GTZ Advisory Committee in Peru.

E. Other Experience

- GTZ Consultant in Project Planning, Follow-up and Assessment, and specific studies.
- Consultant for the Colombian Higher Education Institute, ICFES. Several curriculum assessments at various Schools of Agriculture in Colombia. 1985-88.
- Visiting professor from the German Foundation for International Development, DSE, for the course "Agricultural Marketing", addressed to Latin American professionals. 1986, 1988, 1990 (one month each).
- Moderator at more than 25 ZOPP seminars and 5 workshops with Think Tools in Colombia, Honduras, Costa Rica, Guatemala and Peru.
- Organizer of a series of courses and events on agricultural policy, agricultural marketing, teaching methodology and research, team-work and strategic planning for various audiences.

F. Research and Published Work

- *El Problema de la Diversificación de Exportaciones de Colombia. El ejemplo carne de res.* PhD dissertation at the Berlin Technical University, Federal Republic of Germany. 1976.
- *La política agraria en Colombia 1970-1980*, Tunja, Colombia. 1981.
- *Estudio de factibilidad para la creación de las orientaciones de desarrollo rural y manejo de recursos naturales renovables en la Escuela Agrícola Panamericana*, Honduras. 1990.
- *Ajuste estructural y modernización agrícola en Honduras*. Tegucigalpa. 1994.

C. Training Courses (Selected):

- Advanced training courses for Development Experts. Agricultural Development Seminar at the International Agricultural Development School of the Berlin Technical University, Germany. 1974-1975 (nine months).
- University Didactics. Kassel University, Witzenhausen. Germany 1976-1977
- Group Work. Berlin Technical University, Germany. 1975. (15 days).
- Project Planning and Assessment. Organization of American States, OAS and Universidad de Tunja, Colombia, 1979 (three months)
- Workshop Moderating with Think Tools. GTZ. Frankfurt/M, Germany. 2001
- Ways of Thinking and Acting in Complex Systems. GTZ and German Foundation for International Development, DSE. Bad Honef, Germany. 1998.

CURRICULUM VITAE

Personal information:

Name : **Helle Munk RAVNBORG**
Date of birth : October 13, 1961
Nationality : Danish
Email : hmr@cdr.dk
Language : Danish, English, Spanish, Kiswahili

Thematic specialization:

Collective action; NRM; poverty mapping; agricultural research and extension

Professional profile:

Education : Ph.D., Department of Environment, Technology and Social Studies, Roskilde University Centre, 1993.
M.Sc. (Cand.techn.soc.), Department of Environment, Technology and Social Studies, Roskilde University Centre, 1988.
Other courses : 1990. The post-academic *International Course for Development-Oriented Research in Agriculture* (ICRA), Wageningen Agricultural University.
Country experience : Nicaragua, Colombia, Honduras, Tanzania, Uganda, Kenya, Zimbabwe and Zambia.

Employment:

January 2001 *Senior research fellow, Centre for Development Research, Copenhagen*
Aug 1998 – Dec 2000 *Research fellow, Centre for Development Research, Copenhagen.*
May 2000 *Technical consultant to Red Internacional de Metodología de Investigación de Sistemas de Producción (RIMISP).*
April – May 2000 *Consultant to International Fund for Agricultural Development (IFAD), Rome.*
Oct 1996 – July 1998 *Research Fellow, Centro Internacional de Agricultura Tropical (CIAT), Colombia.*
Jun 1994 – Sep 1996 *Post-doctoral fellow, Centro Internacional de Agricultura Tropical (CIAT), Colombia.*
April – May 1994 *Preparational course for outposting as Junior Professional Officer at Centro Internacional de Agricultura Tropical (CIAT), Colombia*
Aug 1993 – Mar 1994 *Impact Study Specialist, Development Associates, Copenhagen.*
April – July 1993 *Research Fellow. Centre for Development Research, Copenhagen.*
Aug 1989 – Mar 1993 *Ph.D. researcher, Centre for Development Research, Copenhagen.*

Research related activities:

- Scientific advisor to the Norwegian Research Council
- Scientific advisor to the International Foundation for Science, Sweden
- Member of CARE-Denmark's board, Chair of CARE-Denmark's project committee

Selected publications:

- Ravnborg, H.M. *Forthcoming*. "Poverty and Environmental Degradation in the Nicaraguan Hillsides". *World Development*.
- Ravnborg, H.M. 2003. "Pobreza y Degradación Ambiental en las Laderas de Nicaragua". Chapter 5 in: Escobar, G. Ed. 2003. *Pobreza y Deterioro Ambiental en América Latina*. Santiago, Chile: RIMISP. Pp. 107-125.
- Ravnborg, H.M. and O. Westermann. 2002. "Understanding interdependencies: Stakeholder identification and negotiation as a precondition to collective natural resource management. *Agricultural Systems*. Vol. 73, No. 1.
- Ravnborg, H.M. 2002. "Poverty and soil management - evidence of relationships from three Honduran watersheds". *Society and Natural Resources*, Vol. 15, pp. 523-539.
- Ravnborg, H.M.; A.M. de la Cruz; M.P. Guerrero; and O. Westermann. 2002. "Collective action in ant control". Chapter 12 in: Meinzen-Dick, R., A. Knox, F. Place, and B. Swallow. Eds. *Innovation in Natural Resource Management. The Role of Property Rights and Collective Action in Developing Countries* Johns Hopkins University Press.
- Johnson, N.; H.M. Ravnborg; O. Westermann and K. Probst. 2001. "User participation in watershed management and research", *Water Policy*, Vol. 3, no.6, pp. 507-520.
- Ravnborg, H.M. and J.E. Rubiano. 2001. "Farmers' decision making on land use. The importance of soil conditions versus other factors in the case of Río Cabuyal watershed, Colombia." *Danish Journal of Geography*, Vol. 101, pp.115-130.
- Jiggins, J., and H.M. Ravnborg. 2000. Institutional Aspects to Transformation Processes. In: C. Almekinders & W. de Boef (eds), *Encouraging Diversity. A synthesis between crop conservation and development*. London: IT Publications.
- Ravnborg, H.M. and M. P. Guerrero. 1999. "Collective action in watershed management – experiences from the Andean Hillsides". In *Agriculture and Human Values*, Vol. 16, pp. 257-266.
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- **18 Edited publications**
- **9 Papers presented for conferences and seminars**
- **12 Working papers**
- **8 Consultancy reports**

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Education

PhD
1999-2003

University of Nottingham, School of Geography, Nottingham, UK
Fields: Landscape Ecology and Stakeholder Analysis
Thesis: Mapping and modeling stakeholders' visions in Sherwood Forest Natural Area.
Sponsor: Forestry Commission and the University of Nottingham, UK

Master of Science.
Monitoring Modeling
and Management of
the Environmental
Change at the land
surface
1997-1998

King's College – University of London, Geography Department, London, UK
Fields: Hydrological Modeling and Environmental Change.
Thesis: Hydrological Impact of Land Use Change in Tropical Hillside: The Impact of Patterns.
Sponsor: British Council
Participant institutions: Hillside Program of the International Center for Tropical Agriculture, The Hydrology, Ecology and Regional Biodiversity project (HERB), Colombian Environmental Ministry.

Bachelor of Science
1985-1992

Universidad Nacional, Agronomy Faculty, Bogotá, Colombia
Field: Agronomy.
Thesis: Agroecological identification of research needs in Northern Cauca, Colombia. (Meritorious).
Sponsor: The Agroecological Studies Unit, International Center for Tropical Agriculture (CIAT).

Courses
1981-1985:

Universidad Nacional, Faculty of Human Sciences, Bogotá, Colombia
Field: Anthropology
Courses: Social Anthropology, Mathematical Logic, Dialectic

Logic, Linguistics, Ethnography, Geography, and History.

Professional Experience

Postdoctoral Research Fellow Since January 2003	International Center for Tropical Agriculture – CIAT, Land Use Program, Cali, Colombia Projects in progress: Cross Scale Analysis of Vulnerability in Honduras Watershed analysis in the Andes Payments for environmental services
Consultant Since June 2002	International Center for Tropical Agriculture – CIAT, Land Use Program, Cali, Colombia Concept notes development for the CGIAR Challenge Program on Water and Food.
Consultant Oct – Dec 1999	Municipality of Toribio - Indigenous Community, Cauca, Colombia Municipality Land use Planning, I gathered, organized, and processed socioeconomic and geographical data in order to support the process of decision making for natural resource management of the municipality of Toribio, Cauca.
Research Assistant Apr 1993 – Nov 1999	International Center for Tropical Agriculture – CIAT, Hillside Program, Cali, Colombia <ul style="list-style-type: none">- Carried out participatory research experiments addressing poverty and land degradation issues at micro-watershed level in collaboration with the Danish Center for Development and Research (CDR).- Soil and water research, I developed geographical databases for two watersheds, Cabuyal, Cauca (Colombia) and Calico, Matagalpa (Nicaragua).- Development of a support system for decision-making in watershed management in collaboration with Florida University, International Water Management Institute IWMI and HIMAT - Colombia.
Research Assistant	International Center for Tropical Agriculture – CIAT, Hillside Program, Cali, Colombia I studied aquatic macro invertebrates in some watersheds located in the Cauca Valley, Colombia, in collaboration with the University of Toulouse (France).
Research Assistant	International Center for Tropical Agriculture – CIAT, Hillside Program, Cali, Colombia I participated in the development of a decision support system for the management of tropical watersheds in coordination with the

International Water Management Institute IWMI and the Institute of Hydrology and Meteorology HIMAT, Colombia

- Research Assistant **International Center for Tropical Agriculture – CIAT**, Hillside Program, Cali, Colombia
- I organized a workshop about Monitoring and Modeling of Tropical Watersheds in coordination with the University of Florida (USA) and the King's College – London University (UK).
- Technical assistant/
Consultant
May 1992 - Dec 1993 **Indigenous Councils Association**, Northern Cauca, Colombia
- I planned and carried out projects on production and natural resource management, using a participatory approach, in community farms of several Indian.

Awards

- University of Nottingham, School of Geography, UK (1999 -2002): Research Studentship.
- The Forestry Commission, UK (1999 – 2002): Fellowship.
- Department for International Development, UK (1999): Student Grant.
- The British Council (1998): Research Grant.
- The British Council (1997): Graduate Studies Fellowship.
- International Center for Tropical Agriculture, Colombia (1997): Student Grant.
- National University, Colombia (1986 – 1991): Student Grant.

Additional Information

Languages: Spanish, English
Nationality: Colombian
Computer skills

- Office 2000: Word, Excel, Power Point.
- Geographic Information Systems / Remote Sensing: ARC/Info, Erdas, Arcview, Idrisi, MapMaker.
- Databases: Endnote plus, Access.
- Web design: HTML text editing, PageFront.
- Graphics: PaintShopPro, Adobe Photoshop, MSImage Composer.
- Text Analysis: Concordance.
- Video Editing: Adobe Premier, Ulead Studio Vision.

Conferences

- 32nd Annual Conference of the Environmental Design Research Association, Edinburgh July 3-6, 2001 (Lecturer)
- Social Science Research into Woodlands and the Natural Environment, Cardiff University. June 19-20, 2001 (Lecturer)
- International Conference on "Multifunctional Landscapes", Roskilde October 18-21, 2000 (Lecturer)
- Monitoring and Modelling Hydrological Processes in Tropical Hillsides for Decision Support. International Centre for Tropical Agriculture, Cali, Colombia 28 - 29 June 1999. (Organizer and chair) Published in:
<http://www.kcl.ac.uk/kis/schools/hums/geog/advemmm/vol1no1.html>
- First Technical Meeting on Geographic Information Systems and their Applications. November 16-17, 1995, Cali, Colombia (Lecturer)
- II Latin American Symposium on Research and Extension in Farming Systems November 7-9, 1995, CORPOICA, Bogotá, Colombia (Lecturer)
- II Latin American and Caribbean Seminar on Comparative Evaluation of Environmental Impacts. November 6-10, 1995, Santa Marta, Colombia (Lecturer)

Publications

- Fish, R.; Haines-Young, R and Rubiano, J. 2003. Stakeholder Landscapes and GIS, in Palang, H and Fry, G (ed) Landscape Interfaces: cultural heritage in changing landscapes. Kluwer Academic Publishers: Dordrecht, Netherlands.
- Rubiano, J.E. 2003. Incorporating Social and Ecological Values in Landscape Modelling, in Bell, Simon (ed) 'The Potential of Applied Landscape Ecology to Forest Design Planning', United Kingdom, The Forestry Commission.
- Rubiano, J.E. 2002. Modelling stakeholder visions for the Sherwood Natural Area. In 'Trees are Company: Social Science Research into Woodlands and the Natural Environment', United Kingdom, Forest Research publication.
- Ravnborg, H.M., Rubiano, J. E. Farmers' decision making on land use : The importance of soil conditions in the case of Río Cabuyal watershed, Colombia. Geografisk Tidsskrift (Danish Journal of Geography), no. 101, 2001.
- Rubiano, J.E. 2000. Land use and hydrological change in tropical hillsides : the influence of pattern on process. Advances in Environmental Monitoring and Modelling, Monitoring and modelling hydrological processes in tropical hillsides . Department of Geography, King's College London. Vol 1. No. 1
- Ravnborg, H.M.; Ashby, J.A.; Guerrero, M. And Rubiano, J.E. 1996 Burning in hillsides farming - experiments with stakeholders approach for conflict resolution. ILEIA Newsletter April pp 14 – 15.
- Knapp, B.; Rubiano, J. E. and Hansen, J. 1995. Evaluación de la factibilidad de proyectos de mini-irrigación para las cuencas de la región andina colombiana. (Assessment of the feasibility of small-scale irrigation projects in watersheds of the Colombian Andean region). Paper presented at the II Latin American Symposium on

Research and Extension in Farming Systems (IESA-AL-II), held in Bogotá, Colombia, 7-9 November 1995.

- Urbano, P.; Rubiano, J. E.; Bell, W. and Knapp, B. 1995. Cambios en el uso de la tierra como posible indicador de un desarrollo sostenible en una zona de laderas: subcuenca Rio Cabuyal, Cauca, Colombia. (Changes in land use as a possible indicator of sustainable development in a hillside area: the Rio Cabuyal microwatershed, Cauca, Colombia). Paper presented at the IV AESIG Congress held in Barcelona, Spain, 7-9 September 1995.
- Hurtado, M. L.; Rubiano, J. E. 1990. Investigación sobre agricultura en la zona de Roldanillo-La Unión-Toro, antes de la construcción del distrito de riego. (Research on the agriculture history in the Roldanillo-La Unión-Toro region prior to the construction of the irrigation district). Published in NOTRUT, a regional bulletin of the Users' Association of the RUT District.

POTENTIAL ENVIRONMENTAL IMPACT OF THE PROJECT

Potential environmental impact of the Project

Our project is oriented to quantify the physical, biological, economical, and social aspects related to environmental impact, which are occurring in the current land use of the Andean watershed. Based on the magnitude of these environmental impacts we will propose new alternatives that, either by changing land use or land management, can modify in a positive manner the environmental externalities.

We do not know which are the alternatives that will be of priority for the strategic alliances between producers, entrepreneurs, and local governments. However, all of these alternatives should affect positively the current state of the environment and thus, meet the environmental requisites required by WFCP. In case that a negative environmental impact occurs, the alternatives implemented by the project will take the necessary measures to mitigate these negative effects.

GANTT - CHRONOGRAM

OUTPUT	No.Act.	ACTIVITIES	PRINCIPAL INVESTIGATORS <i>See Annex 1. for details of each number</i>	2004	2005				2006					
				Year 1				Year 2				Year 3		
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	
1	Basic Information and main hypothesis to project intervention		RE											
	1	Workshop for project presentation in each pilot watershed	RM,AM,MK,JR											
	2	Previous field recognition of watersheds	RM,AM,MK,JR											
	3	Consecution of secondary information	EG,XP,MQ,RM,MK,CS,AM											
	4	Perceptions of watershed communities about environmental externalities	RM,AM,MK,JR											
	5	Determination of hypothesis about environmental externalities and specific intervention sites in each watershed	RM,AM,MK,RE,RM,MQ,JR,HR											
	6	Identification of possible cooperators and alliances	RM,AM,MK,RE,RM,MQ,JR											
	7	Review of previous experiences in Environmental Service Payment (EPS) mechanisms	MQ,AM,MK											
2	Identification and valuation of environmental externalities		RE											
	8	Determination of hydrological balances	EG,JR,XP,RM,EA											
	9	Scenarios of land use and management practices changes	RE,MO,EG,XP,JR,EA,MR,RD,RH											
	10	Quantification and valuation of marginal changes in environmental externalities	RE,MO,EG,XP,JR,EA,MR,RH											
	11	Preliminary prioritization of Hydrological Response Units (HRU) according with their potential impact on externalities	RE,MO,EG,XP,JR,EA,MR											
3	Risk analysis for natural disasters.		AM											
	12	Vulnerability analysis for watershed population	CS,MK,HR,RM,RD											
	13	Analysis of threats for natural disasters related with water	RE,MO,AM,RD,MK,CS,EG											
	14	Risk Analysis	AM,RE,JR											
4	Socio-economic analysis		AM											
	15	History and future perceptions of watersheds management	RM,AM,MK,JR											
	16	Determination of poverty profiles	HR,OW,MK,AM,MO											
	17	Characterization of production systems	RQ,JB,JE,BR											
	18	Analysis of market opportunities for agricultural products and environmental services and income sources	RM,AM,MK,JR,RE											
5	Institutional analysis		HR											
	19	Workshop for discussion of the preliminary hypothesis about environmental externalities and specific intervention sites	OW,AM,MK,RE,RM,MQ,JR,HR											
	20	Identification of stakeholders, institutions and perceptions of natural resource management	HR,OW,MK,AM,MO											
	21	Analysis of relationships among stakeholders	JC,HR,OW,MK,AM,MO											
	22	Identification of existing rules for watershed resources management	JC,HR,OW,MK,AM,MO											
	23	Prioritization of problems and possible solutions with watershed stakeholders	JC,HR,OW,MK,AM,MO											
	24	Determination of willingness to cooperate and pay for environmental services	JC,HR,OW,MK,AM,MO											
6	Externalities internalization strategies - PES		HR,RE,AM											
	25	Final decision about hypothesis of environmental externalities and specific intervention sites in watersheds	OW,AM,MK,RE,RM,MQ,JR,HR											
	26	Creation and enforcement of negotiation platforms	JC,HR,OW,MK,AM,MO,RE											
	27	Feasibility analysis of investment alternatives	JB,RE,MO,AM,MK,OW											
	28	Design of EPS schemes	MK,JC,RE,MO,AM,OW,HR											
	29	Implementation of a pilot PSA mechanism	MK,JC,RE,MO,AM,OW,JR											
7	Lessons and recommendations		HR,RE,AM											
	30	Project Monitoring	EG,XP,JR,AM,OW,MK											
	31	Results publication	OW,AM,MK,RE,RM,MQ,JR,HR											
	32	Workshop for project results divulgation	OW,AM,MK,RE,RM,MQ,JR,HR											
	33	Identification of watershed characteristics to determine other Andean sites for early extrapolation	OW,AM,MK,RE,RM,MQ,JR,HR											

Year	Quarter	Type of milestone	Description	Deadline	Means of verification
1	1	Input	Purchase of Equipment and materials	Sep-04	Receipts
1	2	Activities	Watersheds profiles	Dec-04	Reports
1	3	Activities	Environmental Payment Service Literature review	Mar-05	Document
1	4	Activities	URH of study sites	Jun-05	Files
2	1	Activities	Optimization model for each watershed	Sep-05	Model and user manual
2	2	Activities	Identification and valuation of Environmental externalities	Dec-05	Reports
1	4	Activities	Watersheds History and future perceptions	Jun-05	Reports
1	4	Activities	Preliminary agreements achieved through negotiation platforms	Jun-05	Reports
2	1	Activities	Risk analysis for natural disaster	Sep-05	Reports
2	1	Activities	Risk maps of watersheds	Sep-05	Maps files
2	1	Activities	Watersheds poverty profiles	Sep-05	Reports
2	1	Activities	Watersheds production systems characterization	Sep-05	Reports
2	1	Activities	Market studies for agricultural products and environmental services and income sources	Sep-05	Reports
2	2	Activities	Stakeholders identification and their relationships and perceptions	Dec-05	Reports
2	2	Activities	Rules and regulations for watersheds management	Dec-05	Reports
2	2	Activities	Prioritization of problems and willingness to cooperate in EPS	Dec-05	Reports
2	2	Activities	Strategic alliances	Dec-05	Reports and agreements
2	2	Activities	Publications	Dec-05	Documents
2	2	Activities	Agreements achieved through negotiation platforms	Dec-05	Reports
2	4	Activities	Feasibility Studies for EPS alternatives	Jun-06	Reports
2	4	Activities	Agreements achieved through negotiation platforms	Jun-06	Reports
3	1	Outputs	Design of ESP scheme	Jul-06	Reports
3	2	Outputs	Agreements achieved through negotiation platforms	Dec-06	Reports
3	2	Outputs	EPS Investment implementation in watersheds	Dec-06	Reports
3	2	Outputs	General results, impacts and recommendations	Dec-06	Reports
3	2	Outputs	Strategic alliances	Dec-06	Reports and agreements
3	2	Outputs	Publications	Dec-06	Documents
3	2	Outputs	A geo-referenced information system on a internet server	Jan-07	Documents
3	2	Outputs	Identification of other 10 Andean watersheds for extrapolation	Dec-06	Reports

OUTPUT	No.Act.	MILESTONES	RESPONSIBLE	2004	2005				2006				
				Year 1				Year 2				Year 3	
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Basic Information and main hypothesis to project intervention		RE										
	1-6	1. Description of watersheds profiles			1								
	7	2. State of the art of Environmental Service Payment - ESP (literature review)				2							
2	Identification and valuation of environmental externalities		RE										
	8-11	3. Environmental externalities identified and valued for each watershed						3					
		4. Optimization model for externalities valuation and its user manual					4						
		5. Hydrological Response Units (HRU) files for each watershed					5						
3	Risk analysis for natural disasters.		AM										
	12-14	6. Risk analysis for natural disasters in each watershed						6					
		7. Watershed risk maps.						7					
4	Socio-economic analysis		AM										
	15	8. Information of watershed management history and future perceptions					8						
	16	9. Poverty and natural resource use profiles for each watershed						9					
	17	10. Production systems characterization for each watershed						10					
	18	11. Analysis of agricultural products and environmental services markets and income sources						11					
5	Institutional analysis		HR										
	19-24	12. Identification of watershed stakeholders and analysis of their relationships							12				
		13. Existing rules and regulations for each watershed management							13				
		14. Prioritization of problems and determination of willingness of stakeholders to cooperate in a EPS scheme							14				
6	Externalities internalization strategies - ESP		HR,RE,AM										
	25	15. Agreements achieved through negotiation platforms					15		15		15		15
	26	16. Feasibility studies of new land uses and management alternatives through EPS									16		
	27	17. Design of ESP scheme										17	
	28	18. Investment implemented through ESP in each watershed											18
7	Learned Lessons		HR,RE,AM										
	30	19. Results, impacts and recommendations of the project											19
	31	20. At least 4 installed strategic alliances							20				20
	32	21. 4 publications finished and a geo-referenced information system							21				21
	33	22. Other 10 Andean watersheds identified for posterior extrapolation											22

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Colby, Bonnie G. and Tamara Pearson d'Estree. 2000a. "Economic Evaluation of Mechanisms to Resolve Water Conflicts" Water Resources Development Vol. 16(2) 239-251.

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[http://www.contraloriagen.gov.co/cdmedioambiente/informe final transferencias](http://www.contraloriagen.gov.co/cdmedioambiente/informe%20final%20transferencias)

Escobar D'Angelo, J. 2000, Costos de transacción en la agricultura peruana: una primera aproximación a su medición e impacto, Documento de trabajo 30, GRADE, Lima, Peru

Estrada, R.D. Posner, J. 2001. The watershed as an organizing principle for research and development. An evaluation of experience in the Andean Ecoregion Mountain research and development. Vol 21 N02 123-127.

Estrada, R.D. 2002, Como incorporar la depreciación de los recursos naturales en las cuentas nacionales. Una primera aproximación basada en la experiencia de CONDESAN en los análisis de las Unidades de Respuestas Hidrológicas (URH). Informe CONDESAN al proyecto GTZ en Colombia. 26p.

Estrada, R.D. and Quintero, M. 2003. Propuesta metodológica de CONDESAN para el análisis de cuencas: Una alternativa para corregir las deficiencias detectadas en la implementación del Pago por Servicios Ambientales. Paper present at the Foro de Pago por Servicios Ambientales FAO. Congreso Latinoamericano de Cuencas. June 13th 2003. Arequipa, Perú.

De Janvry, A. Y Glikman, P. 1991. Encadenamientos de la producción en la economía campesina en el Ecuador. FIDA e IICA. Estrategias para mitigar la pobreza rural en América latina y el caribe 529 p.

Feldspausch, T., M. Rondon, E. Fernandes, S. Riha, E. Wandelli . Carbon and nutrient accumulation in secondary forest regenerating from degraded pastures in central Amazonia, Brazil. J. Ecol. Applic. (in press)

Gonzales, G. 2003. Desaparecen los glaciares de Montaña. Infoandina. Boletín electrónico. 8/18/03 Nodo regional del foro de Montana en America Latina.

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LE TACON, Ph. 1989. Manifestation des risques climatiques á l'échelle de l'exploitation agricole, conséquences sur les pratiques paysannes. Cas de l'altiplano bolivien. Mémoire d'étude. ENSSAA, CNEARC, Dijon, France, 130 p. En: LE TACON, Ph., J.J. VACHER, M.ELDIN, E. IMAÑA. 1991. Los riesgos de helada en el altiplano Boliviano.

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BUDGET

SUMMARY OF RESOURCE INPUTS REQUIRED TO PRODUCE THE PROJECT OUTPUTS						
		Name of Project:				
		Project Leader:				
			COST IN US DOLLARS			
Project Code	Budget Item Code		Year 1	Year 2	Year 3	TOTAL
	CONTRIBUTED FUNDS					
	1	MATCHING FUNDS	456,200	387,200	172,800	1,016,200.00
	RESOURCES REQUESTED FROM THE CHALLENGE PROGRAM ON WATER AND FOOD					
	2	PERSONNEL RENUMERATIONS, TRAVEL AND ACCOMODATION				
	2.1	PERSONNEL COSTS				
	2.1.1	Project Leader	-	-	-	-
	2.1.2	Principal investigators (International)	85,500	109,000	35,000	229,500.00
	2.1.3	Principal investigators (National)	34,500	26,250	10,650	71,400.00
	2.1.4	Consultants	-	-	-	-
	2.1.5	Support Staff	-	-	-	-
	2.2	TRAVEL AND ACCOMODATION				
	2.2.1	Project Leader	-	-	-	-
	2.2.2	Principal investigators (International)	31,000	36,100	24,590	91,690.00
	2.2.3	Principal investigators (National)	16,550	15,500	7,000	39,050.00
	2.2.4	Consultants & Support staff	-	-	-	-
	2.2.5	Other project participants	-	-	-	-
	3	RESEARCH OPERATIONAL COSTS				-
	3.1	EQUIPMENTS				-
	3.1.1	Office equipment	-	-	-	-
	3.1.2	Laboratory equipment	-	-	-	-
	3.1.3	Field equipment	-	-	-	-
	3.1.4	Other equipment	-	-	-	-
	3.2	COMMUNICATION COSTS AND CONSUMABLES				-
	3.2.1	Communication expenses	6,140	3,060	400	9,600.00
	3.2.2	Office supplies	9,000	6,550	-	15,550.00
	3.2.3	Laboratory supplies	-	-	-	-
	3.2.4	Field research supplies	7,250	-	-	7,250.00
	3.2.5	Other support services (please specify	-	-	-	-
	4	MISCELLANEOUS				-
	4.1	CONTIGENCY	-	-	-	-
	4.2	OVERHEADS	7,597.60	7,858.40	3,105.60	18,561.60
	4.3	Others (please specify)				-
						-
	TOTAL REQUESTED FROM THE CPWF		197,537.60	204,318.40	80,745.60	482,601.60
	GRAND TOTAL		653,737.60	591,518.40	253,545.60	1,498,801.60

OUTPUT	No.Act.	MATCHING FUNDS PER OUTPUT												Grand Total
		CUENCAS ANDINAS			CIAT			IIS			Annual totals			
		Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	
1	Basic information and main hypothesis to project intervention													-
	1	5000			2000						7,000	-	-	7,000
	2	6000			2000						8,000	-	-	8,000
	3	10000			1000						11,000	-	-	11,000
	4	4000									4,000	-	-	4,000
	5	5000			2000						7,000	-	-	7,000
	6	5000			2000						7,000	-	-	7,000
	7	6000									6,000	-	-	6,000
2	Identification and valuation of environmental externalities													-
	8	25000	5000		7000	7000					32,000	12,000	-	44,000
	9	12000	4000		4000	7000					16,000	11,000	-	27,000
	10	20000	5000		4000	7000					24,000	12,000	-	36,000
	11	15000	5000		4000	3000					19,000	8,000	-	27,000
3	Risk analysis for natural disasters.													-
	12	25000			3000			8000			36,000	-	-	36,000
	13	16000									16,000	-	-	16,000
	14	10000			3000						13,000	-	-	13,000
4	Socio-economic analysis													-
	15	8000			2000						10,000	-	-	10,000
	16	22000			1000			12000			35,000	-	-	35,000
	17	16000									16,000	-	-	16,000
	18	15000			3000						18,000	-	-	18,000
5	Institutional analysis													-
	19	20000						4000			24,000	-	-	24,000
	20	8000	8000		1000	2000		6000	4000		15,000	14,000	-	29,000
	21	12000	12000		1000	1000		4000	4000		17,000	17,000	-	34,000
	22	8000	8000		1000	1000		5000	4000		14,000	13,000	-	27,000
	23	10000	10000		1000	1000		5000	4000		16,000	15,000	-	31,000
	24	10000	10000		1000	1000		4000	3000		15,000	14,000	-	29,000
6	Externalities internalization strategies - EPS													-
	25		12000		2200			3000	5000		5,200	17,000	-	22,200
	26	20000	100000	30000		10000	6800	6000	6000		26,000	116,000	36,800	178,800
	27		20000			10000			5000	3000	-	35,000	3,000	38,000
	28		25000		1000	4200			4000	3000	1,000	33,200	3,000	37,200
	29		10000	25000	2000		12000		6000	4000	2,000	16,000	41,000	59,000
7	Learned Lessons													-
	30	10000	15000	6000			2500	3000	3000	1500	13,000	18,000	10,000	41,000
	31	15000	15000	15000	2000		2500	2000	3000	1500	19,000	18,000	19,000	56,000
	32		15000	15000	2000		2500	2000	3000	1500	4,000	18,000	19,000	41,000
	33			35000						6000	-	-	41,000	41,000
		338,000	279,000	126,000	54,200	54,200	26,300	64,000	54,000	20,500	456,200	387,200	172,800	1,016,200
				743,000			134,700			138,500				1,016,200

BUDGET BY INSTITUTION														
OUTPUT	No.Act.	CUENCAS ANDINAS			CIAT			ISS			Annual totals			Grand Total
		Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	
1	Basic information and main hypothesis to project intervention										-	-	-	-
	1	1500			2000						3,500	-	-	3,500
	2	1500			2000						3,500	-	-	3,500
	3	3000			1000						4,000	-	-	4,000
	4	1500									1,500	-	-	1,500
	5	2000			2000						4,000	-	-	4,000
	6	2000			2000						4,000	-	-	4,000
2	7	3000									3,000	-	-	3,000
	8	3500	3000		7000	7000					10,500	10,000	-	20,500
	9	3500	3000		4000	7000					7,500	10,000	-	17,500
	10	3500	3000		4000	7000					7,500	10,000	-	17,500
	11	3000	3000		4000	3000					7,000	6,000	-	13,000
3	Risk analysis for natural disasters.										-	-	-	-
	12	6000			3000			2000			11,000	-	-	11,000
	13	5000									5,000	-	-	5,000
	14	4000			3000						7,000	-	-	7,000
4	Socio-economic analysis										-	-	-	-
	15	2000			2000						4,000	-	-	4,000
	16	10000			1000			5000			16,000	-	-	16,000
	17	6000									6,000	-	-	6,000
	18	9200			3000						12,200	-	-	12,200
5	Institutional analysis										-	-	-	-
	19							3000			3,000	-	-	3,000
	20	5000	9700		1000	2000		3000	7000		9,000	18,700	-	27,700
	21	8000	10000		1000	1000		4000	6000		13,000	17,000	-	30,000
	22	8000	10000		1000	1000		3000	4000		12,000	15,000	-	27,000
	23	4500	6000		1000	1000		3000	6000		8,500	13,000	-	21,500
	24	4500	6000		1000	1000		3000	3000		8,500	10,000	-	18,500
6	Externalities internalization strategies - EPS										-	-	-	-
	25		3000	4000	2200			1000	8000		3,200	11,000	4,000	18,200
	26		6000	4000		10000	6800	1600	5760	3300	1,600	21,760	14,100	37,460
	27		5000	1400		10000			5000	3000	-	20,000	4,400	24,400
	28		5000	840	1000	4200			4000	3000	1,000	13,200	3,840	18,040
	29		4000	4000	2000		12000		6000	4000	2,000	10,000	20,000	32,000
7	Learned Lessons										-	-	-	-
	30	2000	3000	3700			2500	1840	3000	2000	3,840	6,000	8,200	18,040
	31						2500	2000	4000	2000	2,000	4,000	4,500	10,500
	32						2500	2000	3000	4000	2,000	3,000	6,500	11,500
	33			7000						6000	-	-	13,000	13,000
		102,200	79,700	24,940	50,200	54,200	26,300	34,440	64,760	27,300	186,840	198,660	78,540	464,040

OUTPUT BUDGET FOR PROJECT PERSONNEL												
OUTPUT	Project Leader			Principal investigators (International)			Principal investigators (National)			Total		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Basic information and main hypothesis to project intervention												
1				1,750	-	-	750	-	-	2,500	-	-
2				2,000	-	-	750	-	-	2,750	-	-
3				2,000	-	-	750	-	-	2,750	-	-
4				1,000	-	-	300	-	-	1,300	-	-
5				1,750	-	-	750	-	-	2,500	-	-
6				1,750	-	-	750	-	-	2,500	-	-
7				2,000	-	-	750	-	-	2,750	-	-
Identification, valuation of env. externalities												
8				4,000	2,500	-	1,500	1,200	-	5,500	3,700	-
9				2,500	4,500	-	450	-	-	2,950	4,500	-
10				2,500	4,500	-	-	-	-	2,500	4,500	-
11				4,500	1,750	-	1,200	1,800	-	5,700	3,550	-
Risk analysis for natural disasters.												
12				4,500	-	-	1,500	-	-	6,000	-	-
13				2,500	-	-	1,500	-	-	4,000	-	-
14				3,250	-	-	1,500	-	-	4,750	-	-
Socio-economic analysis												
15				2,500	-	-	900	-	-	3,400	-	-
16				7,500	-	-	2,700	-	-	10,200	-	-
17				2,500	-	-	900	-	-	3,400	-	-
18				8,500	-	-	1,200	-	-	9,700	-	-
Institutional analysis												
19				1,750	-	-	450	-	-	2,200	-	-
20				4,750	11,500	-	1,500	3,000	-	6,250	14,500	-
21				6,250	10,500	-	1,500	2,700	-	7,750	13,200	-
22				5,750	8,500	-	1,500	2,700	-	7,250	11,200	-
23				4,000	7,000	-	1,500	2,400	-	5,500	9,400	-
24				4,500	5,250	-	1,500	1,500	-	6,000	6,750	-
Externalities internalization strategies - EP5												
25				1,500	6,250	1,250	1,500	1,500	900	3,000	7,750	2,150
26				-	13,250	6,250	900	3,000	1,500	900	16,250	7,750
27				-	12,000	-	-	-	900	-	12,000	900
28				-	9,750	-	900	1,800	900	900	11,550	900
29				-	5,500	12,500	1,500	1,650	1,500	1,500	7,150	14,000
Learned Lessons												
30				-	3,750	3,750	1,200	1,200	1,500	1,200	4,950	5,250
31				-	1,250	1,250	1,200	900	1,500	1,200	2,150	2,750
32				-	1,250	3,750	1,200	900	750	1,200	2,150	4,500
33				-	-	6,250	-	-	1,200	-	-	7,450
Total			-	85,500	109,000	35,000	34,500	26,250	10,650	120,000	135,250	45,650

	MANDAY INPUTS AND RATES												
	Project leader			Principal investigators (International)			Principal investigators (National)			Total			Total
Rate U	260	270	280	250	250	250	150	150	150				
OUTPUT	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	
Basic information and main hypothesis to project intervention													
1				7			5			7	5	5	17
2				8			5			8	5	5	18
3				8			5			8	5	5	18
4				4			2			4	2	2	8
5				7			5			7	5	5	17
6				7			5			7	5	5	17
7				8			5			8	5	5	18
Identification and valuation of environmental externalities													
8				16	10		10	8		26	20	18	64
9				10	18		3			20	21	3	52
10				10	18					28	18	-	46
11				18	7		8	12		25	15	20	60
Risk analysis for natural disasters.													
12				18			10			18	10	10	38
13				10			10			10	10	10	30
14				13			10			13	10	10	33
Socio-economic analysis													
15				10			6			10	6	6	22
16				30			18			30	18	18	66
17				10			6			10	6	6	22
18				34			8			34	8	8	50
Institutional analysis													
19				7			3			7	3	3	13
20				19	46		10	20		65	56	30	151
21				25	42		10	18		67	52	28	147
22				23	34		10	18		57	44	28	129
23				16	28		10	16		44	38	26	108
24				18	21		10	10		39	31	20	90
Externalities internalization strategies - EPS													
25				6	25	5	10	10	6	36	40	25	101
26					53	25	6	20	10	78	84	51	213
27					48	0			6	48	48	-	96
28					39	0	6	12	6	39	45	18	102
29					22	50	10	11	10	72	82	71	225
Learned Lessons													
30					15	15	8	8	10	30	38	31	99
31					5	5	8	6	10	10	18	19	47
32					5	15	8	6	5	20	28	29	77
33						25			8	25	25	25	75
Total				342	436	140	230	175	71	596	438	301	1,335

OUTPUT BUDGET FOR TRAVEL AND ACCOMODATION											
OUTPUT		Principal investigators (International)			Principal investigators (National)			Total			Total
	No. Act	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	
1	Basic Information and main hypothesis to project intervention										
	1	250	-	-	750			1,000	-	-	1,000
	2	750	-	-				750	-	-	750
	3	450	-	-	800			1,250	-	-	1,250
	4		-	-				-	-	-	-
	5	400	-	-				400	-	-	400
	6	800	-	-	700			1,500	-	-	1,500
	7		-	-				-	-	-	-
2	Identification and valuation of environmental externalities										
	8	1,500	2,500	-	1200	2000		2,700	4,500	-	7,200
	9	1,900	2,500	-	1500	1500		3,400	4,000	-	7,400
	10	1,500	3,000	-	1200	1600		2,700	4,600	-	7,300
	11	1,000	1,500	-		900		1,000	2,400	-	3,400
3	Risk analysis for natural disasters.										
	12	1,500	-	-	1800			3,300	-	-	3,300
	13		-	-	1000			1,000	-	-	1,000
	14	1,000	-	-	1000			2,000	-	-	2,000
4	Socio-economic analysis										
	15		-	-				-	-	-	-
	16	3,400	-	-	2400			5,800	-	-	5,800
	17	1,600	-	-				1,600	-	-	1,600
	18	1,500	-	-				1,500	-	-	1,500
5	Institutional analysis										
	19	800	-	-				800	-	-	800
	20	1,200	2,000	-	1500	2000		2,700	4,000	-	6,700
	21	1,750	2,000	-	1500	1500		3,250	3,500	-	6,750
	22	3,500	2,000	-	1200	1500		4,700	3,500	-	8,200
	23	2,700	2,000	-		1500		2,700	3,500	-	6,200
	24	2,500	1,000	-		1500		2,500	2,500	-	5,000
6	Externalities internalization strategies - EPS										
	25		1,600	1,000		1500	500	-	3,100	1,500	4,600
	26		4,500	4,000			2000	-	4,500	6,000	10,500
	27		8,000	3,400				-	8,000	3,400	11,400
	28		1,500	2,840				-	1,500	2,840	4,340
	29		2,000	3,500			2,500	-	2,000	6,000	8,000
7	Learned Lessons										
	30	1,000		950			2,000	1,000	-	2,950	3,950
	31			1,500				-	-	1,500	1,500
	32			2,000				-	-	2,000	2,000
	33	-	-	5,400				-	-	5,400	5,400
		TOTAL	31,000	36,100	24,590	16,550	15,500	7,000	47,550	51,600	31,590

CONSUMABLES AND COMMUNICATION ITEMS BUDGET BY OUTPUT/ACTIVITY														
OUTPUT	No. Act.	Communication			Office			Field			Annual totals			Grand Total
		Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	
1	Basic Inform	550	-	-	1000						1,550	-	-	1,550
	1	-	-	-							-	-	-	-
	2	-	-	-							-	-	-	-
	3	-	-	-							-	-	-	-
	4		-	-							-	-	-	-
	5		-	-							-	-	-	-
	6	-	-	-							-	-	-	-
	7		-	-							-	-	-	-
2	on and	2,000	1,000	-	2000	3050		6000			10,000	4,050	-	14,050
	8			-							-	-	-	-
	9			-							-	-	-	-
	10			-							-	-	-	-
	11			-							-	-	-	-
3	Risk analysi	950	-	-	1000						1,950	-	-	1,950
	12		-	-							-	-	-	-
	13		-	-							-	-	-	-
	14		-	-							-	-	-	-
4	Socio-econo	1,000	-	-	2000						3,000	-	-	3,000
	15		-	-							-	-	-	-
	16		-	-							-	-	-	-
	17		-	-							-	-	-	-
	18		-	-							-	-	-	-
5	Institutional	400	650	-	1000	1000		1250			2,650	1,650	-	4,300
	19		-	-							-	-	-	-
	20			-							-	-	-	-
	21			-							-	-	-	-
	22			-							-	-	-	-
	23			-							-	-	-	-
	24			-							-	-	-	-
6	Externalitie	500	660	400	1000	1500					1,500	2,160	400	4,060
	25										-	-	-	-
	26										-	-	-	-
	27										-	-	-	-
	28										-	-	-	-
	29										-	-	-	-
7	Learned Lex	740	750	-	1000	1000					1,740	1,750	-	3,490
	30										-	-	-	-
	31										-	-	-	-
	32										-	-	-	-
	33	-	-								-	-	-	-
		6,140	3,060	400	9,000	6,550	-	7,250	-	-	22,390	9,610	400	32,400
NOTE: The values has been only assigned per outputs														

BUDGET									
	TOTAL			W&FCP			(NAR"S,ARIS,ONG"S)		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
International									
CG Center	111,800	116,800	33,400	53,000	58,000	16,600	58,800	58,800	16,800
NARES	31,400	42,000	12,000	9,400	10,000	4,000	22,000	32,000	8,000
ARI	64,500	82,400	45,000	23,100	41,000	14,400	41,400	41,400	30,600
NGOs	-	-	-				-	-	-
National	-	-	-						
CG Center	18,000	18,000	9,000	9,000	9,000	4,500	9,000	9,000	4,500
NARES	47,500	17,250	18,450	25,500	17,250	6,150	22,000	-	12,300
ARI	-	-	-				-	-	-
NGOs	-	-	-						-
Nat'l Staff Salaries	18,600	16,000	-				18,600	16,000	-
Office & Research	-	-	-						-
CG Center	20,500	19,500	10,200	5,500	4,500	200	15,000	15,000	10,000
NARES	31,640	27,110	10,200	9,640	5,110	200	22,000	22,000	10,000
ARI	10,000	10,000	10,000				10,000	10,000	10,000
NGOs	-	-	-				-	-	-
International	-	-	-						-
CG Center	17,200	15,800	10,000	7,200	6,000	5,000	10,000	9,800	5,000
NARES	19,000	13,000	10,690	14,000	8,000	8,190	5,000	5,000	2,500
ARI	15,800	28,100	14,400	9,800	22,100	11,400	6,000	6,000	3,000
NGOs	-	-	-						-
Local Travel	-	-	-						-
CG Center	10,000	10,000	2,500	5,000	5,000	2,500	5,000	5,000	-
NARES	25,050	24,000	8,000	10,050	9,000	3,000	15,000	15,000	5,000
ARI	6,500	6,500	6,500	1,500	1,500	1,500	5,000	5,000	5,000
NGOs	-	-	-						-
Workshops	-	20,000	30,000	-	-	-		20,000	30,000
Fellowships	20,000	25,000	-				20,000	25,000	-
Publications &	30,000	100,000	30,000		-	-	30,000	100,000	30,000
Vehicles &	-	-	-						-
CG Center	25,000	30,000	-				25,000	30,000	-
NARES	27,250	28,700	-	7,250			20,000	28,700	-
ARI	-	-	-						-
NGOs	-	-	-						-
Contingency	-	20,000	-	-	-	-		20,000	-
overhead	7,598	7,858	3,106	7,598	7,858	3,106			
Total	557,338	678,018	263,446	197,538	204,318	80,746	359,800	473,700	182,700

OTHER DATA

PRINCIPAL INVESTIGATORS						
No.	NAME		AREA (discipline)	INSTITUTION	TITLE	EMAIL
1	Alonso Moreno	AM	Rural development (Economist)	GTZ	PhD	amoreno@cgiar.org
2	Helle Munk Ravnborg	HM	Poverty baselines and local welfare measures (sociologist)	ISS	PhD	hmr@cdr.dk
3	Ruben Dario Estrada	RE	Optimisation models and environmental externalities (Economist)	CIP-CIAT	MSc	rdestrada@cgiar.org
4	Jorge Rubiano	JR	(Hydrologist)	CIAT	PhD	j.rubiano@cgiar.org
5	Edgar Amezcuita	EA	Soil physics (Agronomist)	CIAT	PhD	eamezcuita@cgiar.org
6	Marco Rondon	MR	Greenhouse gas balances. (Biogeochemistry)	CIAT	PhD	mrondon@cgiar.org
7	Roberto Quiroz	RQ	Remote sensing, trade off models (Chemist)	CIP	PhD	rquiroz@cgiar.org
8	Marcela Quintero	MQ	Regional planning (Ecologist)	CIAT	B. Sc	mquintero@cgiar.org
9	Roberto Mendez	RM	Watershed management (Hydrologist)	CONDESAN-PROMIC	MSc	roberto.mendez@promic-bolivia.org
10	Ernesto Giron	EG	Georeferenced systems and friendly interfaces for hydrological balances (Survey Engineering)	CIAT	BSc	cuencas@cgiar.org
11	Ximena Pernet	XP	Georeferenced systems and friendly interfaces for hydrological balances (Agricultural Engineering)	CIAT	BSc	xpernett@hotmail.com
12	Olaf Westermann	OW	Institutional Analysis (Sociologist)	ISS	MSc	hmr@cdr.dk
13	Marina Kosmus	MK	Natural Resource Economics			

ASSOCIATE INVESTIGATORS						
No.	NAME		AREA (discipline)	INSTITUTION	TITLE	EMAIL
14	Julio Berdegue	JB	Farming systems (Economist)	RIMISP (NGO research)	PhD	iberdegue@rimisp.cl
15	Juan Camilo Cardenas	JC	Collective action and natural resource management. (economist)	CONDESAN-Javeriana University	PhD	jccarden@javeriana.edu.co
16	Bernardo Rivera	BR	Livestock systems (Veterinarian)	CONDESAN-Caldas University	PhD	bernaviae@hotmail.com
17	Ramiro Diaz	RD	Seismology and its impact on water availability and erosion (Geologist)	CONDESAN-National University	MSc	ramdiaz@ciencias.unal.edu.co
18	Robert Hostede	RH	Paramos Ecosystems (Ecologist)	CONDESAN-ECOPAR	PhD	ecopar1@uio.satnet.net
19	Carlos Silva.	CS	Small farmers financing systems (Lawyer)	CONDESAN-CEDEPAS	BSc	csilva@cedepas.org.pe
20	Javier Escobal	JE	Technology impact and social and economic analyses (Economist)	RIMISP-	PhD	jescobal@grade.org.pe

Table of Third Party IP to be Used in the Program (to be completed by Project Leaders)

Description of Third Party IP – <u>what is it?</u>	Source of Third Party IP – <u>where did it come from?</u>	Owner of Third Party IP – <u>who’s owns it?</u>	IP Rights Owned by Third Party – <u>what kind of IP rights does the owner have?</u>	Status of Third Party IP Rights – <u>do you have a legal right to use it?</u>
1. Tangible Property – “Things”				
Equipment with GPS and GIS (Arc View) incorporated (iPAQ)	GTZ	Hellwett Packard HP (hardware), Navman (GPS) and ESRI (GIS)	Trademark	ESRI License
2. Methods of “Doing Something”				
None				
3. Written Text and Computer Code				
Satellite images, Landsat (2000, 2002) for Andean Region	Global Land Cover Facilities, University of Maryland. Accessed by internet	NASA	Copyright	Unknown
Soil and Water Assessment Tool - SWAT	Internet	USDA Agricultural Research Service at the Grassland, Soil and Water Research Laboratory in Temple, Texas, USA.	Copyright	Free access. As the results are published, the program and web page must be referenced.
Global elevations datasets, SRTM -90	United States Geological Survey (USGS) accessed by internet	NASA	Copyright	

Climatic data base for four Andean watersheds: (Fuquene (Colombia), Ambato (Ecuador), Jequetepeque (Perú) and Cordillera de Tunari (Bolivia))	Colombia: CAR (Corporación Autonoma Regional) Ecuador: GTZ Perú: It has not been obtained yet. GTZ may provide it. Bolivia: It has not been obtained yet. The counterpart (PROMIC) may provide it.	Colombia: IDEAM Ecuador: INAMHI Peru: SENAMI Bolivia: Unknown	Copyrights	Confidentially Disclosure Agreement. The climatic databases are obtained by previous payment but they are not freely available for others.
Optimization Models	CONDESAN	CONDESAN	Copyrights	Free availability

SUPPORT LETTERS

I I S
Institute for International Studies

Challenge Program on Water and Food Consortium
c/o International Water Management Institute
Colombo
SRI LANKA

27 August 2003
J.no. 3016

Dear Sirs,

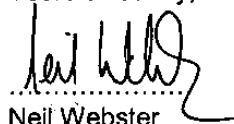
This letter certifies our institutional commitment to participation in the Challenge Program on Water and Food as set out in the project proposal to which this letter is an Annex. In doing so, the institution accepts the rules of operation that apply to the Challenge Program. Further, the institution recognizes that the final decision on selection of the project proposal lies with the Consortium Steering Committee, and that their decisions are final.

In particular, our institution agrees to meet its commitments on the following issues:

- The availability of the identified Principal Investigator(s), other personnel, and resources, as specified in the project document and budget, who fully understand their role in the proposed project. In the case of a change in the Principal Investigator(s), personnel of similar ability and qualifications will be made available.
- The timely submission of reports as requested on any intellectual assets that are developed using Challenge Program funding, and the provision of support to any intellectual asset audit or request for an internal inventory of such assets.
- The provision of matching funds, whether this be in cash or in kind, as identified in the project proposal.

Our institution is aware of the objectives of the Challenge Program and is committed to the overall goals of addressing improvements in levels of food security, poverty, health, and environmental security that guide the Program. In signing this letter, we understand that it forms the basis for a Memorandum of Understanding between the parties of the project proposal, should the proposal be successful.

Yours sincerely,



Neil Webster
Head of Department

Institute for International Studies
Gammel Kongevej 5 · DK-1610 Copenhagen V · Denmark
Tel: +45 3385 4600 · Fax: +45 3325 8110 · E-mail: cdr@cdr.dk



*Uso sostenible de la Tierra en Cuencas
Hidrográficas de los Andes*
CONDESAN - REDCAPA - GTZ
c/o Centro Internacional de la Papa
Av. La Molina 1895, Lima 12, Perú
Tel: (51 1) 349-6017, anexo 2181
Fax: (51 1) 317-5326
Correo electrónico: a.moreno@cgiar.org

September 3rd. , 2003

Challenge Program on Water and Food Consortium
C/o International Water Management Institute
Colombo
SRI LANKA

Dear Sirs,

This letter certifies our institutional commitment to participation in the Challenge Program on Water and Food as set out in the project proposal to which this letter is Annex. In doing so. The GTZ Project "Andean Watersheds" (Cuencas Andinas) and the other involved GTZ projects,
(Perú: Recovery and Prevention in Natural Catastrophes, in Piura;
Risk management of Natural Catastrophes with focus in food security, in Arequipa ;Integrated development Alto Mayo, in Moyobamba
Ecuador: PROMACH, Río Ambato in Quito; Colombia: PROCAS, in Bogotá

accept the rules of operation that apply to the Challenge Program. Further, the institution recognizes that the final decision on selection of the project proposal lies with the Consortium Steering Committee, and that their decisions are final.

In particular, our institution agrees to meet its commitments on the following issues:

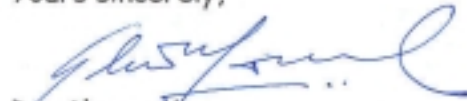
- The availability of the identified Principal Investigator(s), other personnel, and resources, as specified in the project document and budget, who fully understand their role in the proposed project. In the case of a change in the Principal Investigator(s), personnel of similar ability and qualifications will be made available.

.. 2

- The timely submission of reports as requested on any intellectual assets that are developed using Challenge Program funding, and the provision of support to any intellectual asset audit or request for an internal inventory of such assets.
- The provision of matching funds, whether this is in cash or in kind, as identified in the project proposal.

The project "Cuencas Andinas" is aware of the objectives of the Challenge Program and is committed to the overall goals of addressing improvements in levels of food security, poverty, health, and environmental security that guide the Program. In signing this letter, we understand that it forms the basis for a Memorandum of Understanding between the parties of the project proposal, should the proposal be successful.

Yours sincerely,



Dr. Alonso Moreno
AP Project "Cuencas Andinas"

AM/pb



CONSORCIO PARA EL DESARROLLO SOSTENIBLE
DE LA ECORREGION ANDINA

Centro Internacional de la Papa (CIP)
P.O. Box 1558
Lima 12, Perú
Tel.: (51-1) 317-5313
Fax: (51-1) 317-5326
Correo E.: condesan@cigiar.org

L. 067-CONDESAN-2003

August 22, 2003

Challenge Program on Water and Food Consortium
C/o International Water Management Institute
Colombo,
SRI LANKA

Dear Sirs,

This letter certifies our institutional commitment to participation in the Challenge Program on Water and Food as set out in the project proposal to which this letter is an Annex. In doing so, CONDESAN accepts the rules of operation that apply to the Challenge Program. Further, the institution recognizes that the final decision on selection of the project proposal lies with the Consortium Steering Committee, and that their decisions are final.

In particular, our institution agrees to meet its commitments on the following issues:

- The availability of the identified Principal Investigator(s), other personnel, and resources, as specified in the project document and budget, who fully understand their role in the proposed project. In the case of a change in the Principal Investigator(s), personnel or similar ability and qualifications will be made available.
- The timely submission of reports as requested on any intellectual assets that are developed using Challenge Program funding, and the provision of support to any intellectual asset audit or request for an internal inventory of such assets.
- The provision of matching funds, whether this is in cash or in kind, as identified in the project proposal.

CONDESAN is aware of the objectives of the Challenge Program and is committed to the overall goals of addressing improvements in levels of food security, poverty, health, and environmental security that guide the Program. In signing this letter, we understand that it forms the basis for a Memorandum of Understanding between the parties of the project proposal, should the proposal be successful.

Yours sincerely,



Elias Mujica
Coordinator in charge



Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

Teléfono: +57 (2) 4450000 (directo); +1 (550) 8336625 (vía USA)
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Correo electrónico: ciat@cgiar.org
Internet: www.ciat.cgiar.org

Apartado Aéreo 6713, Cali, Colombia

22 August 2003
PO-338

Challenge Program on Water and Food Consortium
C/o International Water Management Institute
Colombo,
SRI LANKA

Dear Sirs,

This letter certifies our institutional commitment to participation in the Challenge Program on Water and Food as set out in the project proposal to which this letter is an Annex. In doing so, CIAT accepts the rules of operation that apply to the Challenge Program. Further, the institution recognizes that the final decision on selection of the project proposal lies with the Consortium Steering Committee, and that their decisions are final.

In particular, our institution agrees to meet its commitments on the following issues:

- The availability of the identified Principal Investigator(s), other personnel, and resources, as specified in the project document and budget, who fully understand their role in the proposed project. In the case of a change in the Principal Investigator(s), personnel of similar ability and qualifications will be made available.
- The timely submission of reports as requested on any intellectual assets that are developed using Challenge Program funding, and the provision of support to any intellectual asset audit or request for an internal inventory of such assets.
- The provision of matching funds, whether this is in cash or in kind, as identified in the project proposal.

CIAT is aware of the objectives of the Challenge Program and is committed to the overall goals of addressing improvements in levels of food security, poverty, health, and environmental security that guide the Program. In signing this letter, we understand that it forms the basis for a Memorandum of Understanding between the parties of the project proposal, should the proposal be successful.

Yours sincerely,

Joachim Voss
Director General

