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The World Bank

Report No: ICR0000875

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-50612)

ON A

GRANT

IN THE AMOUNT OF SDR 3.7 MILLION EQUIVALENT (US$ 4.5 MILLION)

TO

CENTRO AGRONOMICO TROPICAL DE INVESTIGACIÓN Y ENSEÑANZA
(CATIE)

FOR THE

INTEGRATED SILVOPASTORAL APPROACHES TO ECOSYSTEM

MANAGEMENT PROJECT

IN COLOMBIA, COSTA RICA, AND NICARAGUA

November 2008

Environmentally and Socially Sustainable Development
Central American Department
Latin America and Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective 31 January, 2008)

Currency Unit = Costa Rica Colon
530.61 = US$ 1.00 US Dollar

FISCAL YEAR

ABBREVIATIONS AND ACRONYMS

ABC	American Bird Conservancy
ASOMSIF	Association of Nicaraguan Microfinance Organizations
AU	Animal Unit
BOD	Biological Oxygen Demand
CAS	Country Assistance Strategy
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza
CCAD	Central American Commission on Environment and Development
CIAT	Centro lnternacional de Agricultura Tropical
CIPAV	Centre for Research on Sustainable Agricultural Production Systems
COLCIENCIAS	Colombian Institute for Science and Technology
CORFORGA	Corporación Ganadera de Costa Rica
CRQ	Corporación Autónoma Regional del Quindío
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDL	Fondo de Desarrollo Local
FEDEGAN	Federación Colombiana de Ganaderos
FONAFIFO	Fondo Nacional de Financiamiento Forestal
GEF	Global Environment Facility
GHG	Greenhouse gases
IBD	Inter-American Development Bank
TIRI	Intemational Livestock Research Institute
INBIO	Instituto Nacional de la Biodiversidad Costa Rica
LEAD-FAO	Livestock, Environment and Development Initiative
MAGFOR	Ministerio AgropecuarioForestal de Nicaragua
MARENA	Ministerio del Ambiente y los Recursos Naturales de Nicaragua
MBC	Mesoamerican Biological Corridor
MINAE	Ministry of Environment and Energy Costa Rica
MAVDT	Ministerio del Medio Ambiente de Colombia
MTR	Mid-term Review
NITLAPAN-UCA	Institute of Research and Development of the University of Central America
NTU	Nephelometric Turbidity Unit
OCIC	Oficina Costarricense de Implementación Conjunta
PES	Payment for Environmental Services
PAD	Project Appraisal Document
SPS	Silvopastoral System
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WB	World Bank
WWF	World Wildlife Fund

Vice President:	Pamela Cox
Country Director:	Laura Frigenti
Sector Manager:	Laura Tlaiye
Project Team Leader:	Juan Pablo Ruiz
ICR Team Leader	Gunars Platais

COLOMBIA, COSTA RICA, AND NICARAGUA
INTEGRATED SILVOPASTORAL APPROACHES TO
ECOSYSTEM MANAGEMENT PROJECT

CONTENTS

A. Basic Information

Country:	Latin America	Project Name:	Integrated Silvopastoral Approaches to Ecosystem Management
Project ID:	P072979	L/C/TF Number(s):	TF-50612
ICR Date:	11/13/2008	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	CATIE
Original Total Commitment:	USD 4.5M	Disbursed Amount:	USD 4.5M
Environmental Category: B		**Global Focal Area: B**	

Implementing Agencies:

Centro Agronomico Tropial de Investigacion y Ensenanza
Center for Research on Sustainable Agricultural Production Systems, CIPAV in Colombia
Institute of Research and Development of the University of Central America, NITLAPAN-UCA Nicaragua

Cofinanciers and Other External Partners:

LEAD-FAO
American Bird Conservancy

B. Key Dates

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	01/18/2001	Effectiveness:	08/02/2002	07/23/2002
Appraisal:	12/03/2001	Restructuring(s):		
Approval:	05/02/2002	Mid-term Review:	04/17/2006	04/27/2006
		Closing:	07/31/2007	01/31/2008

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Satisfactory
Risk to Global Environment Outcome	Low or Negligible
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank	Satisfactory	**Overall Borrower**	Satisfactory

Performance:		**Performance:**	

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
GEO rating before Closing/Inactive status	Satisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Agricultural extension and research	50	50
General agriculture, fishing and forestry sector	50	50
Theme Code (Primary/Secondary)		
Biodiversity	Primary	Primary
Climate change	Primary	Primary
Land administration and management	Primary	Primary
Other rural development	Primary	Primary
Participation and civic engagement	Primary	Primary

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Pamela Cox	David de Ferranti
Country Director:	Laura Frigenti	Jane Armitage
Sector Manager:	Laura E. Tlaiye	John Redwood
Project Team Leader:	Juan Pablo Ruiz	Paola Agostini
ICR Team Leader:	Juan Pablo Ruiz	
ICR Primary Author:	Gunars H. Platais	

F. Results Framework Analysis

Global Environment Objectives (GEO) and Key Indicators(as approved)

To demonstrate and measure the effects of the introduction of payment incentives for environmental services to farmers on their adoption of integrated silvopastoral farming systems in degraded pasture lands in Colombia, Costa Rica and Nicaragua and the improvements in eco-systems functioning, global environmental benefits, and local socio-economic gains resulting from the provision of said services through (i) incremental local environmental benefits; (ii) incremental global environmental benefits; (iii) experience on farmers' reactions to the payment of environmental services and experiences in the management of payment incentive schemes required to produce global environmental benefits; and (iv) guidelines for the sustainable financing mechanisms for the promotion of silvo-pastoral systems to rehabilitate degraded pastures.

Revised Global Environment Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

While the Global Environment Objective remained the same, an adjustment was made in the biodiversity indicator given that the MTR panel of experts deemed it unrealistic to increase 50 bird species per production system. This parameter was modified to compare the increase of bird species and other biodiversity indicators in each land use to that of degraded and grass monoculture pastures controls. Since certain taxa move at different scales (e.g. mollusk, butterflies and ants), a decision was made to include other taxas so as to have solid data on the impacts of silvopastoral and other land use changes on biodiversity indicators.

The following table includes the 11 intermediate outcome indicators reported as of the April 2005 Implementation Status Report, the last three which were included following MTR recommendations to strengthen evidence supporting the benefits of land use changes induced by project. Soil erosion, stocking rate and herbicide use parameters were included in subsequent ISRs to demonstrate the positive impacts of project interventions.

(a) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	The project will improve biodiversity and carbon sequestration indices in at least 12,000 hectares of degraded pastures in the three project countries.			
Value (quantitative or Qualitative)	0 hectares with improvements in the three countries	12,000 hectares with improved biodiversity and carbon sequestration indices		12,260 hectares with improved biodiversity and carbon sequestration indices
Date achieved	07/23/2002	01/31/2008		02/21/2008
Comments	100% - by project closing, 12,260 hectares had improved biodiversity and carbon			

(incl. % achievement)	sequestration indices. The project surpassed its goal by 3%, at the beginning the project had greater impacts on area affected but in the final years some farms were sold.

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	4,000 hectares of silvopastoral systems established in the three project countries.			
Value (quantitative or Qualitative)	0 hectares of silvopastoral systems established in the three project countries	4,000 hectares of silvopastoral systems established in the three project countries		3,673.2 hectares of silvopastoral systems established in the three project countries
Date achieved	07/23/2002	01/31/2008		02/21/2008
Comments (incl. % achievement)	90% 4,000 ha. target was not achieved as 27 farms initially participating in the project were sold: 5 in Colombia; 13 in Costa Rica; and 9 in Nicaragua. New farms could not be contracted under project after 2 years, as established in legal agreement.			
Indicator 2 :	Increased carbon sequestration in project farms receiving payments for environmental services.			
Value (quantitative or Qualitative)	0 tons of incremental carbon sequestered annually in areas projected to receive payments for environmental services	25,000 tons of carbon sequestered annually in areas receiving payments for environmental services		19,558 incremental tons of carbon sequestered annually in areas receiving payments for environmental services
Date achieved	07/23/2002	01/31/2008		02/21/2008
Comments (incl. % achievement)	Project sequestered 71,887 ton CO2 equivalent compared to the target - which should have been stated in its CO2 equivalent in the PAD. Results also showed that improved quality fodder associates with reductions (>35%) in methane & nitrous oxide emissions			
Indicator 3 :	Increased biodiversity in the pilot zones in the three project countries.			
Value (quantitative or Qualitative)	Forest dependent bird species in Costa Rica, 26; Colombia, 74; Nicaragua 40. Butterfly species: 67. Mollusk species: 35.	Number of bird species in secondary and riparian forests: 117.4. Butterfly species: 18.2. Mollusk species: 80		Forest dependent bird species: 197 (Costa Rica- 42; Colombia- 104; Nicaragua- 51); Butterfly species: 130; Mollusk species: 81.
Date achieved	01/21/2008	01/31/2008		02/21/2008
Comments (incl. %	100% Info. on chosen monitoring species was not available for SPS, thus targets were set conservatively; final results demonstrated much greater achievements			

achievement)	than expected, partially due to increased sampling frequency & in resulting vegetation structure			
Indicator 4 :	Increased biodiversity and environmental services generated through index developed and measured by the project.			
Value (quantitative or Qualitative)	Average index for 3 countries: 0.39	N.A.		0.53
Date achieved	07/23/2002	01/31/2008		02/21/2008
Comments (incl. % achievement)	100% - Since the biodiversity index was constructed after project start (see Section 1.7 for its parameters), no original target was available. This biodiversity index is being adopted by local and national organizations to monitor biodiversity			
Indicator 5 :	Eco-services payments implemented in each of the three target countries.			
Value (quantitative or Qualitative)	0 farmers received eco-services payments in the three countries	292 farms receiving eco-services payments: 105 in Costa Rica, 107 in Nicaragua and 80 in Colombia		265 farms receiving eco-services payments: 92 in Costa Rica, 98 in Nicaragua and 75 in Colombia
Date achieved	07/23/2002	01/31/2008		02/21/2008
Comments (incl. % achievement)	91% achievement # 292 target was not achieved as 27 farms initially participating in project were sold: 5 in Colombia; 13 in Costa Rica; 9 in Nicaragua. New farms could not be contracted under project after 2 years, as established in the legal agreement			
Indicator 6 :	Voluntary changes in land use in the three project countries, with a resulting increase in area destined to live fences and forest regeneration.			
Value (quantitative or Qualitative)	Live fences in the three project countries = 354,2 kms, while forest systems (young and advanced secondary forest, riparian forest, bamboo and primary forests) = 3,023.3 hectares	Live fences in the three project countries = 1,100 kms, while forest systems (young and advanced secondary forest, riparia n forest, bamboo and primary forests) = 2,900 hectares		Live fences in the three project countries = 1,342 km., while forest systems (young and advanced secondary forest, riparian forest, bamboo and primary forests) = 3,087 hectares
Date achieved	01/21/2008	01/31/2008		02/21/2008
Comments (incl. % achievement)	100% - project induced desired land use changes in more areas than expected (as measured in ha.). Many farmers invested in live fences and high density trees in pastures to benefit from PES because it didn't compete with their agricultural production			
Indicator 7 :	Specific recommendations for best ranching practices to sustain higher biodiversity and increase ranch yield disseminated among farmers, community organizations, policymakers and regional networks.			
Value (quantitative or Qualitative)	No such information exists	A minimum of 1,200 farmers, 12 NGOs and/or		5,097 farmers, 77 NGOs and/or community-based

		community-based groups, policymakers and regional networks receiving relevant in formation		groups, policymakers and regional networks receiving relevant information
Date achieved	07/23/2002	01/31/2008		02/21/2008
Comments (incl. % achievement)	This indicator evidences the project's success in reaching farmers, technical staff & decision makers. Once changes were introduced and results demonstrated, interest in training and peer-to-peer sessions sponsored by project, increased.			
Indicator 8 :	Income in pilot farms increased by 10% during the project's duration			
Value (quantitative or Qualitative)	Dollar income per hectare (revenues minus direct costs) for Costa Rica: $162, Nicaragua: $111.2 and Colombia: $440.8	Dollar income per hectare (revenues minus direct costs) for Costa Rica: $162.9, Nicaragua: $116.9 and Colombia: $484.9		Dollar income per hectare (revenues minus direct costs) for Costa Rica: $252, Nicaragua: $180 and Colombia: ($1,597, under review)
Date achieved	07/23/2002	01/31/2008		02/21/2008
Comments (incl. % achievement)	The project has shown that SPS, once implemented, are competitive with the alternative practices in place before the project			
Indicator 9 :	Reduction in soil erosion in project areas.			
Value (quantitative or Qualitative)	Mean soil erosion in 3 countries 80.9 tons/ha	N.A.		Mean soil erosion in 3 countries 44.1 tons/ha
Date achieved	01/21/2008	01/31/2008		02/21/2008
Comments (incl. % achievement)	In supervision mission 11, the team evaluated that it would be possible and very useful to include this indicator # CATIE worked to develop the equations to estimate soil erosion in the different land uses.			
Indicator 10 :	Increase in stocking rate (cows/ha)			
Value (quantitative or Qualitative)	1.8	N.A.		2.5 cows/ha
Date achieved	07/23/2002	01/31/2008		02/21/2008
Comments (incl. % achievement)	The introduction of improved fodder technologies on farms resulted in improvements in socking rates.			
Indicator 11 :	Decrease in use of herbicides (liters)			
Value (quantitative or Qualitative)	13,913.6	N.A.		7,899.9 liters
Date achieved	01/21/2008	01/31/2008		02/21/2008
Comments (incl. % achievement)	Improved management of silvopastoral technologies resulted in a reduction in the use of herbicides, for weed control was decreased by 43.2 %.			
Indicator 12 :	Specific recommendations for best ranching practices to sustain higher			

	biodiversity and increase ranch yield disseminated among farmers, community organizations, policymakers and regional networks.			
Value (quantitative or Qualitative)	No such information exists	A minimum of 1,200 farmers, 12 NGOs and/or community-based groups, policymakers and regional networks receiving relevant in formation		
Date achieved	07/23/2002	01/31/2008		
Comments (incl. % achievement)				
Indicator 13 :	Income in pilot farms increased by 10% during the project's duration			
Value (quantitative or Qualitative)	Dollar income per hectare (revenues minus direct costs) for Costa Rica: $162, Nicaragua: $111.2 and Colombia: $440.8	Dollar income per hectare (revenues minus direct costs) for Costa Rica: $162.9, Nicaragua: $116.9 and Colombia: $484.9		
Date achieved	07/23/2002	01/31/2008		
Comments (incl. % achievement)				
Indicator 14 :	Reduction in soil erosion in project areas.			
Value (quantitative or Qualitative)	Mean soil erosion in 3 countries 80.9 tons/ha	N.A.		
Date achieved	01/21/2008	01/31/2008		
Comments (incl. % achievement)				
Indicator 15 :	Increase in stocking rate (cows/ha)			
Value (quantitative or Qualitative)	1.8	N.A.		
Date achieved	07/23/2002	01/31/2008		
Comments (incl. % achievement)				
Indicator 16 :	Decrease in use of herbicides (liters)			
Value (quantitative or Qualitative)	13,913.6	N.A.		
Date achieved	01/21/2008	01/31/2008		

Comments (incl. % achievement)	

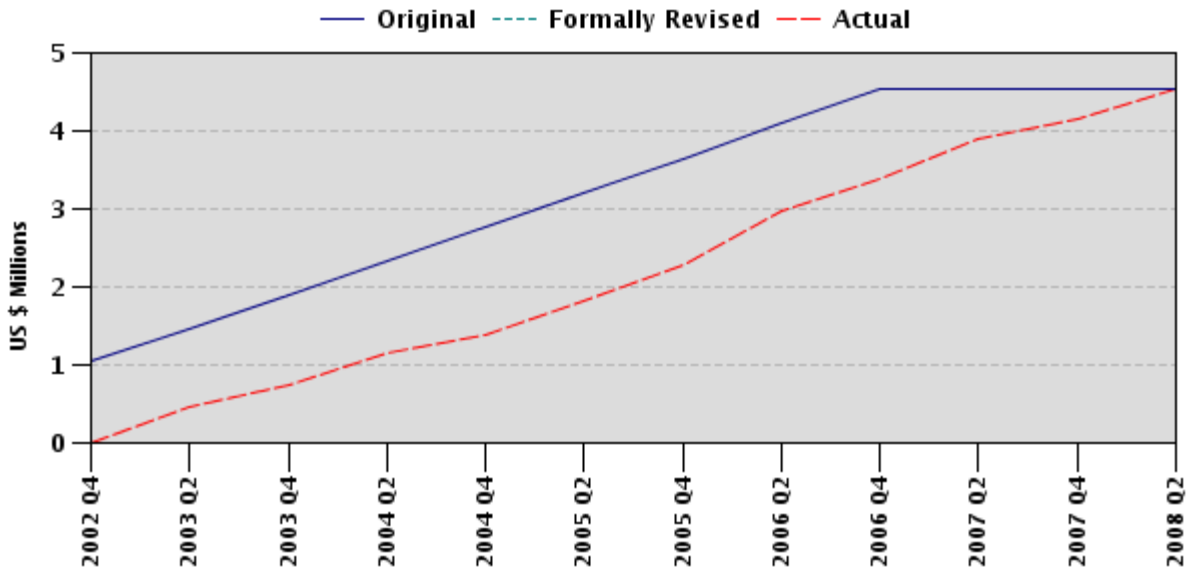
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	06/25/2002	Satisfactory	Satisfactory	0.00
2	12/19/2002	Satisfactory	Satisfactory	0.45
3	06/25/2003	Satisfactory	Satisfactory	0.73
4	12/22/2003	Satisfactory	Satisfactory	1.09
5	06/22/2004	Satisfactory	Satisfactory	1.28
6	12/15/2004	Satisfactory	Satisfactory	1.71
7	04/20/2005	Satisfactory	Satisfactory	1.98
8	04/12/2006	Satisfactory	Satisfactory	3.12
9	06/19/2006	Satisfactory	Satisfactory	3.35
10	08/04/2006	Satisfactory	Satisfactory	3.48
11	03/29/2007	Satisfactory	Satisfactory	3.97
12	08/30/2007	Satisfactory	Satisfactory	4.27
13	01/29/2008	Satisfactory	Satisfactory	4.50
14	03/24/2008	Satisfactory	Satisfactory	4.50

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal

In 2002, about 38 percent (94 million out of 248 million hectares) of Central America's total land area was used as permanent pasture, and this area had expanded over the previous decade in the three project countries (Colombia, Costa Rica and Nicaragua) at a rate of between four and nine percent, mostly at the expense of tropical forest. Thus, ranching-induced deforestation was one of the main causes of loss of some unique plant and animal species in the tropical rainforests of Central and South America. Despite significant efforts to reduce destruction of tropical forests and protect the natural habitats and wildlife populations in Latin America, the beginning of the new century did not look more promising for the preservation of tropical rainforest and biodiversity than the preceding years. Over the previous decade, natural forest areas in the three countries had been reduced between 6 and 25 percent.

In the past, government-backed conversion of forest to other land uses, such as large scale ranching, was one of the leading causes of deforestation. At project outset poverty, joblessness and inequitable land distribution was forcing many landless peasants to clear the forest for subsistence farming. The decline in productivity and the lack of appropriate technologies in the agricultural frontier forced many small farmers to sell cleared land to livestock farmers. Over the last years, considerable progress has been made in reforestation, in particular in Costa Rica, providing an overall picture of increasing forest cover. However, the contribution of such replacement plantation forest to biodiversity and even carbon sequestration and biodiversity is less than that of the primary forest. Reducing the pressure on primary forest therefore remained important.

Classical approaches to conservation, attempting to preserve pristine habitats within National Parks and other protected areas are necessary, but insufficient in the face of growing pressure on land. Driven by social and economic pressures and unsustainable land use patterns, local settlers continue their expansion into the last remnants of native forests. The silvopastoral technology proposed under the project could reduce the pressure, and therefore complement the protected area management approach.

Colombia: The project was consistent with the World Bank's overall objective in the Country Assistance Strategy for Colombia which was to achieve sustainable development with continual reduction of poverty and improvement of social conditions in an environment of peace. The CAS recognized Colombia's global environmental importance and identified environmental protection and conservation combined with macroeconomic stability to be essential elements to ensure sustainable development. This project contributed to the CAS's strategic focus on sustainable development to: (i) improve natural resource management and strategic ecosystem conservation; (ii) strengthen the effectiveness of the decentralized environmental management system and seek partnership opportunities with the private sector, NGOs and academia; and (iii) promote employment opportunities for the disadvantaged through environmentally sustainable projects.

Costa Rica: The project was compatible with the World Bank's Country Assistance Strategy for Costa Rica, which directly supported improved incentives for private sector-led growth, improved natural resource management through the conservation of forest ecosystems, and poverty alleviation through targeting small farmers and the rural poor for contracts for conservation easements, sustainable forest management, and reforestation. The project was also consistent with

the national environmental policies to develop alternatives for degraded lands and conservation of biodiversity in agricultural landscapes.

Nicaragua: The project was consistent with the World Bank's Country Assistance Strategy for Nicaragua, which identified the destruction of forests as an issue of major importance for the country, and gave top priority to improving natural resource management.

The Silvopastoral Project was designed to assist the three countries to:

- Develop technological choices in controlling livestock induced deforestation;
- Address socio-economic issues linked to livestock grazing; and
- Identify means to overcome barriers (financial, knowledge, policy) to the adoption of silvopastoral systems (SPS).

1.2 Original Global Environment Objectives (GEO) and Key Indicators

The main development objective was to demonstrate and measure the effects of the introduction of payment incentives for environmental services to farmers on their adoption of integrated silvopastoral farming systems in degraded pasture lands in Colombia, Costa Rica and Nicaragua and the improvements in ecosystem functioning, global environmental benefits, and local socio-economic gains resulting from the provision of said services through:

(i) incremental local environmental benefits;
(ii) incremental global environmental benefits;
(iii) experience on farmers' reactions to the payment of environmental services and experiences in the management of payment incentive schemes required to produce global environmental benefits; and
(iv) guidelines for the sustainable financing mechanisms for the promotion of silvopastoral systems to rehabilitate degraded pastures.

Key Outcome performance indicators include:

- Sustainable silvopastoral systems established in three Latin American countries and improved water quality in six watersheds in Latin America.
- Improved habitat for diverse types of biodiversity provided; stable carbon sequestered in the soil and in commercial wood, under silvopastoral systems (SPS) in six watersheds in three countries.
- Improved resource monitoring methodologies developed for measuring carbon sequestration, biodiversity conservation and sustainable funding mechanism established which provide appropriate incentives to induce farmers to provide global environmental benefits.
- Increased awareness of the potential in environmental services provided by integrated ecosystem management and experience gained for future development of the integrated ecosystem management approaches to restore degraded pasture.
- Guidance for future funding, lessons for replication/best practice, and policy requirements for environmental services in livestock production defined.

1.3 Revised GEO and Key Indicators, and reasons/justification

The Global Environmental Objective did not change. After mid-term review, however, it was recommended that the indicator measuring biodiversity be revised given that a panel of experts deemed it unrealistic to increase 50 bird species per production system. This parameter was modified to make the comparison of an increase in bird species and other biodiversity indicators in each land use to that of degraded and grass monoculture pastures which served as controls. Given the importance of monitoring taxa moving at different scales, so as to have a sound

understanding of how silvopastoral habitats affect biodiversity in agricultural landscapes, indicators were enhanced with the inclusion of butterflies, ants and mollusks.

Three other indicators were added at MTR: a) reduction in soil erosion in project areas (an interest was expressed in understanding the relationship between SPS and the conservation of soil resources); b) Increase in stocking rate (cows/ha); and c) Decrease in use of herbicides (liters). These indicators were included per recommendation of the MTR team as a means of measuring how farmers have changed their practices to adopt more environmentally-friendly farming practices.

1.4 Main Beneficiaries

The direct beneficiaries included small and medium-sized landowners (10-80 hectares farms), depending mostly on livestock and food crop production, with an average annual income from the farm of about US $3,000. In line with the Bank strategy, a particular focus would be on smallholders in Nicaragua. The beneficiaries also included rural communities and non-government organizations involved in the project. The environmental benefits related to biodiversity conservation and reduction of greenhouse gases likewise accrued to the international community. Finally, the further development of the methodologies to measure carbon sequestration, biodiversity and water quality, as well as the lessons learned on the cost-benefits of SPS and the mechanisms of payment for ecological services directly benefited a number of initiatives in other countries in Latin America and other continents (see Section 2.5 for details).

1.5 Original Components

Component 1: Ecosystems Enhancement and Capacity Building (US$ 4.8 million of which US$1.5 million GEF)

Under this component, the program strengthened local organizations to train and assist farmers in the introduction of silvopastoral systems, and, more generally, support them in management of sustainable livestock production systems and integrated ecosystems. A series of activities at different levels were carried out in each of the three countries, targeted to a wide range of stakeholders.

Component 2: Monitoring Environmental Services (US$0.95 million of which US$0.90 GEF)

This component prepared and implemented a system to monitor land use changes, carbon sequestration, biodiversity, and water quality to provide accurate information and understanding of the potential of intensified SPS in providing global ecological services and local socioeconomic benefits. The key elements were: the monitoring of bird populations as an indicator for biodiversity[1]; soil organic matter to measure carbon sequestration; and aquatic fauna as water quality indicator. These indicators were related to changes in land use, which were then established as the main proxy for overall ecosystems functioning. Socioeconomic impacts of intensified SPS were measured as another key element of this component and are further discussed in Annex 3.

[1] This was later enhanced with the monitoring of butterflies, ants and mollusks as explained in section 1.7.

Component 3: Eco-services Payment (US$1.35 million of which US$1.20 million GEF)
The objective of this component was to gain experience on beneficiaries' response to farms investments in biodiversity conservation and carbon sequestration to produce global environmental benefits.

The eco-services payment mechanism provided incentives for land use changes that lead to improved biodiversity and carbon sequestration (measured under Component 2) on 300 small and medium size livestock farms in the target sites in the three countries. No payment for improved water quality was envisaged, as this is not a global environmental good.

Component 4: Policy formulation and dissemination (US$0.30 million of which US$0.20 GEF)
Under this component, policy guidelines for the sustainable intensification of livestock production and specific recommendations for sector and environmental policies on land use and environmental services were formulated as recommended by the socio-economic assessment. The identification of instruments to ensure the sustainability of the mechanism to pay for environmental services was included under this component. A strong socioeconomic monitoring subcomponent was established to achieve this, which led to targeted policy recommendations on the replication and scaling up of project activities after completion.

Component 5: Project Management (US$1.00 of which US$0.70)
The project was executed in a period of 5.5 years (which included a half year extension) and its overall implementation was entrusted to CATIE in Costa Rica. Local implementation was carried out by UCA-NITLAPAN in Nicaragua, CATIE for the sites in Costa Rica and CIPAV in Colombia. Incremental expenses related to project management included financing the costs of project coordinators, financial project managers and support staff for each of the three participating organizations, which directed, coordinated and monitored project activities.

1.6 Revised Components
Project components were not revised.

1.7 Other significant changes

Biodiversity index. As indicated earlier, the MTR mission concluded that the original biodiversity indicator to increase 50 bird species per production system was unrealistic and insufficient. The decision to make the biodiversity indicator more comprehensive also stemmed from the need to enhance knowledge of how different taxa behave in agricultural landscapes and to use this to develop a simple tool that can be mainstreamed in PES systems. An agreement was reached in which this parameter would be modified by comparing the increase in species of birds and other biodiversity indicators (butterflies, ants and mollusks) in each land use, to that of degraded and grass monoculture pastures which were established as controls. Based on available monitoring data for biodiversity indicators in each country, tree cover and species were identified as the two most important variables explaining biodiversity variation. Annex 9 provides a detailed explanation of this index.

Environmental service index payment increase. A decision was made in the December 2004 supervision mission to increase the payment per environmental service index point (see Section 2.2. for index details) from US$50 to US$75/point for the 4 year project participants and to US$110/point for those under the 2 year regime. This decision was based primarily on the fact that participants considered the US$50/point payment insufficiently attractive to justify widespread adoption of silvopastoral practices and on revised financial analysis presented to a

Bank mission (Gobbi, J. 2002). The limited adoption of these practices in the first year of the project further corroborated this decision. In addition, many participants who did wish to adopt silvopastoral practices more extensively encountered considerable difficulties in financing the required investments; a higher payment per point provided additional liquidity to overcome this constraint.

A decision was also made to make the payments earlier in the year (May-June instead of August-September) in order to conform to the agricultural cycle. Payments in 2003 came too late to help finance planting prior to the beginning of the dry season, especially in Nicaragua. Subsequent years proved much more effective.

Reallocation of funds from PES Component 3. At the time of the signing of the grant agreement, the allocation to PES in each country was overestimated. However, this was only able to be determined after the second payment had been made and each country team had sufficient information to determine with more certainty the amounts to be employed in the third and fourth payments (including a surplus in case of need). At this stage however, only half of the farmers (those participating in the 4 year contracts) were entitled to a payment. Given the resulting surplus, monies were transferred from the PES component to other activities. It was agreed that reallocated funds would be used to perform more water quality monitoring and additional biodiversity monitoring in Costa Rica and Nicaragua. In addition to monitoring birds and plants, the project would monitor butterflies in Costa Rica, mollusks in Nicaragua and ants in Colombia. It was also agreed upon that one consultant would be hired to consolidate the biodiversity data in order to propose changes in the land use index values at the time of the project's MTR.

Extension for 6 months. With the delays at the outset of the project, partly due to its complexity, a 6-month extension was granted so that it could comfortably finalize its activities. In particular, the extension allowed for the completion of the last PES and monitoring the projects' land use change impacts.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

(a) Consistency with overall strategies/priorities. Project design and objectives were consistent with all three country and sector priorities as included in the corresponding CAS (see Section 1.1).It should be noted, however, that while the project was broadly consistent with CAS focus on sustainable natural resource management, none of these Strategies or the Bank's lending portfolio in the three countries reflected a strong interest in supporting operations in agricultural, natural resources, or livestock. This interest is slowly changing as they gain traction with decision makers on several fronts – sustainable rural development, conservation, climate change, and carbon and the fact that the Bank has a proven track record in these areas.

(b) Soundness of background analysis. The GEF-financed project preparation grant was used to fund a series of studies that provided critical input (De Haan et al 2000 and Ibrahim et al 2000). This was important input given that the project was designed as a pilot to test the effects of payment schemes on the adoption of conservation practices in the agricultural setting, in particular on cattle farms. Given the innovativeness of the project, the team did not have previous examples on PES in agricultural landscapes to rely on for lessons learned. At project outset, the available experiences in PES were exclusively on forest ecosystems. The team, however, was composed of international experts (CATIE, LEAD-FAO, World Bank) who have been working

extensively in the agricultural, natural resources and environmental services areas, and relied on extensive work that CATIE, CIPAV and NITLAPAN have carried out in the rural areas of Costa Rica, Colombia and Nicaragua, respectively. This allowed them to identify a range of technical alternatives in each country. As a result, the silvopastoral systems tested in the project were grouped into four main categories: 1) forest plantations with livestock grazing; 2) live fencing, wind protection shields, biological corridors and shade for animals; 3) managed succession within silvopastoral systems; and 4) intensive systems for cattle and other animal species. A complete list of studies, reports, journal articles and books undertaken in preparation and throughout implementation is available in Annex 7.

(c) Participation. Reflecting on the Bank's accumulated expertise in participatory processes, including in the rural setting, the project undertook local consultations during preparation which included the scientific community, technical experts, farmers, private sector, government and NGOs. These consultations continued throughout the life of the project and included workshops and meetings with local farmers' organizations, agricultural and environmental scientists, and government environmental organizations. The series of training courses for farmers also proved quite successful and helped introduce farmers to the new production technologies and research methodologies. Producer visits to participating farms played a key role in accelerating SPS adoption in light of cultural practices that have made cattle ranchers cautious of introducing trees in pastures or modifying their traditional management systems with anything more than improved pastures. All of these activities proved quite effective as there was a considerable amount of interest and active participation from all sectors. Ultimately, the scaling up of the project in Colombia under the auspices of FEDEGAN (the Cattle Ranchers Federation), the incorporation of silvopastoral practices into the activities supported by FONAFIFO in Costa Rica, and the Local Development Fund's (FDL) inclusion of a line of credit for farmers to pursue silvopastoral practices in Nicaragua are all testaments to a successfully implemented participation strategy (see Sections 2.5 and 3.5 for more information on the project's ongoing knowledge transfer).

(d) Risks. Similar to other conservation-oriented projects, the key risks identified were broadly categorized into: i) political support; ii) stakeholder interest (farmers, local organizations, policy setting institutions); and iii) sustainability. Below are some of the key concerns and how they played out during implementation:

Political support – this, as predicted, turned out to be of minimal significance, especially as the positive results started to surface with project implementation. In Costa Rica, the last two Ministers of Environment were very supportive of the project and requested support to develop a strategy on biodiversity conservation in agricultural landscapes. In Colombia, the Ministry of Agriculture is supporting Silvopastoral Systems with a line of credit especially tailored for this purpose.

Stakeholder interest – early during implementation a concern was that project incentives would not be sufficient to motivate farmer participation. However, a higher SPS adoption rate was observed after year 2 when payments per point were increased as described earlier. This was not without risk: a higher amount per point, in the context of a short-term payment, could increase the risk that participants would adopt otherwise unprofitable practices only temporarily. However, as seen in the case of Colombia, FEDEGAN was able to obtain the establishment of a line of credit for SPS which is serving as counterpart funding to the GEF *Mainstreaming Biodiversity in Sustainable Cattle Ranching* follow-on project. Here again producer visits to project farms were fundamental in generating credibility, particularly as richer farm owners provided evidence of the economic benefits of adopting SPS.

- *Sustainability* – even with strong institutional backing (e.g. FAO-LEAD, CATIE), government and civil society support, and a solid dissemination strategy throughout the region, the moral hazard that economic incentives would increase deforestation simmered in the background. The project never allowed this to materialize as measures were established at its outset to define what the baseline forest cover of a farm was. The fact that farmers who were only awarded 2-year PES had not converted back to pastures without trees by project end and to the contrary, had kept the land use change induced by the project is a clear indication of the intervention's sustainability where there is a win-win situation. Strategies to induce biodiversity-friendly land management in cattle ranching farms differ according to the profitability of the land use change and the environmental services it provides: (i) Profitable land use changes for cattle ranchers, having positive impacts on biodiversity and carbon sequestration but fewer contributions to environmental services, can be induced with technical assistance and credit (e.g. improved pastures with high density Leucaena or low tree density, fodder banks); (ii) Land use changes having a moderate short-term impact on farm productivity but offering clear economic returns in the mid to long term, will require short term PES to promote their adoption by compensating for initial investments (e.g. live fences, trees in pastures with diversified commercial value); (iii) Changes representing an opportunity cost for farmers in the short term, as they imply withdrawing farm land from cattle ranching production for the provision of high value environmental services, will demand mid to long term PES (e.g. watershed protection, secondary forest recovery in degraded pastures). Long-term, non-reversible sources to finance these payments are required. The successful adoption of all three types of changes will rely on farmer training and the provision of technical assistance

As the economic and financial analysis shows, SPS practices can be profitable and thereby of interest to the farmer to continue. Currently, producers in Colombia are willing to take out loans to establish SPS and Nicaragua's Local Development Fund (FDL) is lending to small farms for SPS investments and satisfactorily recuperating its credit portfolio – two additional sustainability indicators.

2.2 Implementation

(a) Effective partnerships for implementation. The project was fortunate to rely on top rated organizations in each of the countries during design and implementation. In Costa Rica, the executing and coordinating organization, CATIE, is a well known international nonprofit civil association that conducts research, education and outreach activities in agricultural sciences, agro-forestry systems, and natural resources management. Also in Costa Rica, the project channeled funds to farmers through FONAFIFO – the semi-autonomous state institution responsible for the successful implementation of a national Environmental Services Program. In Nicaragua, NITLAPAN, a non-profit Jesuit university is highly respected with a strong field presence offering extension services throughout the country. Lastly, in Colombia the project was able to rely on CIPAV, whose institutional mission is to contribute to sustainable development through research, training, and communication related to production systems appropriate for tropical agro-ecosystems. CIPAV is currently leading the efforts for the GEF follow-on project. In each country, partners of these executing agencies were strengthened as a way to increase local capacities for the development of sustainable livestock systems. Other international partners enhanced project implementation such as LEAD-FAO, which provided co-financing in the sum of US$ 350,000 for part of the PES in Costa Rica and several activities under the policy component. The American Bird Conservancy, an important participant in biodiversity

conservation in the Americas, was awarded a US$200,000 sub-contract for monitoring biodiversity in project areas given its expertise and specialization.

(b) Experimental design. In many ways, the Silvopastoral Project could be considered as a research project. In addition to providing incentives to farmers to adopt silvopastoral practices that generate environmental services, it was also designed to assess whether payments for environmental services could change behavior; measure the extent to which silvopastoral practices contributed to improved livestock production, increased generation of ecosystem services of global importance, provided local environmental benefits, and contributed to the wellbeing of local populations, under a range of agro-ecological, socio-economic, and institutional conditions. Many aspects of the project's design were affected by this research agenda, including the inclusion of three sites in different countries, the extensive monitoring, the use of control groups, and the use of slightly different contracts for subgroups of participants.

Some aspects of the design proved less effective than had been hoped. The differentiation of those that would receive payments for four years against those that would only receive it for two years created confusion (despite efforts to explain that payments had been adjusted so that both received similar amounts for similar efforts) and increased the workload, out of proportion to the benefits achieved. The control groups were not always optimally chosen and were small in size, limiting their usefulness. It must be recalled, however, that the project was designed prior to the need for careful assessments of the impact of conservation policies becoming prominent. Ferraro and Pattanayak's influential paper, for example, was not published until 2006. In this respect, the project was actually ahead of the curve. Indeed, Ferraro was invited to help design the monitoring framework for the project, and one of his collaborators (Ricardo Godoy) participated in the launch workshop. That the control group selection proved less than optimal in some cases can be ascribed in part to the inexperience of using such mechanisms in World Bank/GEF projects. To our knowledge, no earlier World Bank/GEF project included a control group.

The execution of this ambitious plan sometimes fell short. Some of the field staff involved, for example, had many years of experience working with farmers but much less background in research. In some cases, they may have continued to see their primary objective as supporting farmers rather than carrying out a carefully monitored design experiment. The role of CATIE and the inclusion of academic partners in monitoring efforts at each site helped to offset this problem, however.

The PES mechanism was used to evaluate farmers' response to incentive systems for global environmental benefits in terms of land use changes. Farmers who received PES were divided in groups of 2 and 4-year schemes, receiving US$110 and $75 per incremental ecological point, correspondingly, after the ESI payment increase in 2005. An additional differentiation was made between farmers that would and would not receive technical assistance. The objective was to evaluate if farmers with a 2-year PES scheme would continue to manage the system after payment, and identify the interventions producing the best results in terms of land use change induction and SPS adoption.

The popularity of the project was reported to have resulted in a degree of resentment by some farmers who wished to participate but could not be included because of limited funding. This also complicated the selection of control groups, and contributed to the sub-optimal selection of farmers for the control group at one of the sites.

(c) Environmental Services Index. To provide payments closely correlated to levels of service provision, the project developed indices of biodiversity conservation and carbon sequestration under different land uses, then aggregated them into a single 'environmental services index' (ESI) (Pagiola et. al., 2007). The ESI distinguishes 28 different land uses (see Table A9.1). The biodiversity conservation index was scaled with the most biodiversity-poor land uses (degraded pasture and annual crops) set at 0.0 and the most biodiversity-rich land use (primary forest) set at 1.0. Within this range, a panel of experts assigned points to each land use, taking into consideration factors such as the number of species, their spatial arrangement, stratification, plot size, and fruit production. Similarly, the carbon sequestration index assigns points to different land uses according to their capacity to sequester stable carbon in the soil and in hard wood. The index is scaled so that 1 point equals about 10tC/ha/year. As payments in this case come solely from the GEF, only global benefits were included in the ESI. In each country, 30 farms were monitored to evaluate the impacts on productivity and socioeconomic indicators. Additional funding was obtained from the World Bank to evaluate the impacts of PES on poverty (Pagiola et. al., 2008).

In an analysis of land use change in the project site in Nicaragua (Matiguás-Río Blanco), based on payments for environmental services per ESI points, Pagiola et.al. (2008), shows that there was substantial change in the first year. Over 17 per cent of the total area (545 ha) experienced some form of land use change. A wide variety of changes were observed, ranging from minor changes such as sowing improved grasses in degraded pastures to very substantial changes such as planting high-density tree stands or establishing fodder banks.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

Logical Framework: The project's logical framework was consistently used during project implementation as a means of monitoring project outputs. Having been designed as a pilot project with the objective of demonstrating and measuring the effects of adopting biodiversity friendly practices the project relied on a series of in depth analysis to measure these impacts. These are evident in the long list of dissemination and training material for farmers, their organizations and technical staff, briefing documents for policy makers, reports, publications, and peer reviewed articles and books that the ensuing research has generated (see Annex 7), also materials for policy makers, farmers and their organizations. The project's three main areas of impact as reflected in the Logical Framework are: a) the farm impact – once farmers have been introduced to SPS they have adopted it wholeheartedly. The impact on the family economy is significant with up to fivefold increases; b) institutional impact – the organizations that have participated in the project have had an opportunity to improve not only their research skills but also their extension services, fiduciary responsibilities and inter-institutional dialogue; and c) the ability to replicate – the project has been able to share the voluminous knowledge generated not only at the local level but also regionally and internationally. Project lessons are being applied to other projects and research experiments across the region and the wolrd. The project's well designed monitoring system has been able to demonstrate the benefits of induced land use changes.

2.4 Safeguard and Fiduciary Compliance

At project outset and as reflected in the ISDS, only two safeguards policies were applicable: Environmental Assessment and Natural Habitats. After further review by the Safeguards Policy Group, two other policies were included: Natural Habitats and Pest Management. From an environmental perspective the project has proven to be benign (see Sections F, 3 and 6 and Annex 2 for details).

(a) Environmental safeguards – the project was rated B category as no major adverse environmental impacts were expected from a design that would increase conservation, knowledge and sustainable use of globally important biodiversity in Colombia, Costa Rica and Nicaragua. Although a full environmental assessment was not required, LEAD did undertake an analysis of the positive impact of implementing SPS under the project. It recognized that driven by social and economic pressures and unsustainable land use patterns, local settlers continue their expansion into the last remnants of native forests. Multi-purpose farming and agroforestry practices applied to livestock production enterprises open new avenues for farmers to link sound agricultural development with conservation. The project had highly beneficial impacts upon the environment by supporting improved natural resource management and biodiversity conservation, fully complying with the objectives of OP 4.36 Forestry, namely, "to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development."

(b) Fiduciary Aspects. The project suffered initial delays in implementation due to deficiencies in procurement and delays in the signature and implementation of the subsidiary agreements between CATIE and CIPAV and NITLAPAN. Six months into the project, the Bank's procurement specialist rated procurement as unsatisfactory. CATIE soon hired a procurement specialist replacement who proceeded to train corresponding colleagues in Costa Rica, Colombia and Nicaragua. With essential, trained staff in place and the signing of the agreements, the lag in project disbursement was incrementally reduced. In April 2005, procurement was upgraded to Satisfactory and remained as such. By the end of project, 100 percent disbursement was reached. With respect to its Financial Management, the project did not present any issues as reflected in the ISRs.

2.5 Post-completion Operation/Next Phase

Replicability and scaling up of the project is an objective that is being met. Colombia is moving forward with an independent follow-up project through which FEDEGAN, a partner in this project, plans to scale SPS up to 62,000 hectares in prominent cattle ranching areas throughout the country[2]. In Costa Rica, the project created a demand for this type of payment scheme amongst cattle ranchers and payments for SPS-generated environmental services will be recognized by FONAFIFO under its national PES program. Nicaragua, through its FDL, is also moving forward on scaling-up with a line of credit to promote the adoption of SPS that over 300 farmers have already benefitted from. The GoN is also considering a follow-on project that looks at agriculture from a much more integrated perspective. This includes payments to cattle ranchers that adopt practices that are environmentally friendly.

The project is successfully influencing policies and practices across the public and private sectors in the three countries intervened. In June 2007 the Colombian Ministry of Agriculture established the Incentivo de Capitalizacion rural ICR [3] for any type of farmer interested in implementing SPS. Besides FEDEGAN and FONAFIFO, CORFORGA in Costa Rica (the cattle farmers' association) has employed this experience to develop an incentive scheme for environmentally-friendly livestock systems, including a credit line for good farming practices that encompasses

[2] More than symbolically, the President of FEDEGAN has implemented 120 ha. of SPS on his farm with own resources.

[3] The ICR subsidizes agricultural investment provided that this is being funded by a loan rediscounted with Finagro

silvopastoral practices. Moreover, the IDB-funded project on training and payment for environmental services in Costa Rica is using this experience to guide the compensation of farmers for the adoption of good farming practices, as is the Regional Environmental Authority (CRQ) in Colombia.

The lessons learned from this project are not only being reapplied in the countries the project was implemented, but also throughout the world. Regionally, CCAD is using project generated information to promote sustainable land management in Central America. In Latin America, FAO has established a network on sustainable livestock systems (CODEGLAC) supported by the project. Globally, CATIE is collaborating with FAO-LEAD to develop proposals using project experience, for example, for watersheds in India. Furthermore, World Bank projects under different stages of preparation incorporating environmental service payments for watershed protection and forest conservation have benefited from the knowledge gained under the project (Brazil, Ecuador, El Salvador, Guatemala, Honduras and Mexico), as have the UNEP Chiapas, Mexico and the UNDP Arco–seco Panama initiatives. The follow-up intervention to the Ecomarkets project in Costa Rica, the *Mainstreaming Market Based Instruments for Environmental Management* project, will differentiate payment schemes in light of lessons learned under this intervention that it leads to increased project efficiency.

Additionally, during the project's final year, Rainforest Alliance collaborated with CATIE to develop a standard for the certification of livestock systems with silvopastoral practices, using project indicators. A draft standard has been completed and is currently under global consultation. NESTLE has supported this effort with the aim of improving the quality of milk collected from farms adopting silvopastoral systems. It is expected that this certification, once launched, will provide incentives for adoption of SPS.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

The objectives, design, and implementation of the Integrated Silvopastoral approaches to Ecosystem Management Project are considered to be of a **high overall relevance**. The development objective of demonstrating and measuring the effects of the introduction of payment incentives for environmental services to farmers on their adoption of integrated silvopastoral farming systems in degraded pasture lands in Colombia, Costa Rica and Nicaragua remains highly relevant. The importance of strengthening the link between agricultural practices and environmental stewardship is gaining traction as agricultural policies in the region and across the world are consistently seeking ways to adapt. This is also quite clear when markets send strong signals by providing, for example, a premium for agricultural products produced in an environmentally friendly manner.

In the three project countries there are examples of organic or environmentally friendly livestock production. In Nicaragua there has been an attempt to produce organic meat for the North American market. Costa Rica's organic market is incipient, but showing a consistent increase in demand over the last decade. Markets are still imperfect, and have not fully internalized environmental externalities such as biodiversity and carbon. Information is a key element in breaking this barrier and the project has contributed significantly towards this objective, but more is needed. For example, a more solid intervention promoting SPS as a climate change adaptation strategy is pending and is now being incorporated into the follow-up project in Colombia. In this regard, measuring the effects of the introduction of payment incentives to farmers for the

environmental services resulting from their adoption of integrated silvopastoral farming systems remains highly relevant.

It is worth highlighting the project's successful introduction of adjustments to a cattle rancher's productive system as a change in cattle ranching production systems with PES support rather than a conservation land use change. Environmentally-friendly cattle ranching practices were promoted without the necessity of modifying their main cattle ranching activity.

3.2 Achievement of Global Environmental Objectives

The project was able, to a large extent, to attain the outcomes envisioned at project design. Silvopastoral systems were successfully introduced in the three participating countries. The project has been successful in demonstrating and measuring the effects of the introduction of payment incentives to farmers for the adoption of integrated silvopastoral farming systems. Accumulated PES per farm between 2003 and 2008 was US$2,500, US$2,400 and US$2,300 for Costa Rica, Nicaragua and Colombia, respectively[4], resulting in 12,262 hectares of improved biodiversity and carbon sequestration indices by the end of implementation (the target was 12,000 hectares). Many other environmental benefits of silvopastoral systems were demonstrated: improvement of water infiltration; soil retention; soil productivity; reduction of fossil fuel dependence (e.g. substitution of inorganic fertilizer with nitrogen fixing plants); diversification of farm benefits; scenic beauty enhancement; and land rehabilitation (see Annex 2 for details).

Perhaps one of the most innovative outcomes of this project was the establishment of a differentiated payment scheme according to the degree of environmental service being provided. This was innovative in various fronts. First, it eliminates the inefficiencies of paying a flat fee per hectare for conservation on a farm irrespective of the level of conservation effort applied by the farmer. This scheme allowed farmers to decide "how much" conservation they were willing to undertake (see Murgueitio et. al., 2003). While the flat fee is easier to manage it is surely not economically efficient. In Costa Rica, FONAFIFO is now considering a differentiated scheme in part due to its success of applying the Silvopastoral payments in Esparza. Amounts now need to be adjusted for farm location, as similar land use changes in different areas will provide different environmental services that should not be equally rewarded. The scaling up operation in Colombia will seek to address this issue.

Second, the ability of the silvopastoral project to effectively integrate biodiversity conservation into cattle ranching, was equally innovative. This has truly been a win-win situation. Farmers have been able to increase productivity, reclaim degraded soils and increase biodiversity conservation. Third, Water quality (turbidity, BOD), in the areas of the project, is also markedly better. The live fences proved to provide a much enhanced habitat for a wide diversity of species and facilitate the genetic flow of species by providing a safe corridor through which to traverse larger landscapes.

Another important outcome is in the use of SPS in improving productivity and mitigation of greenhouse gases. Carbon was sequestered both in the soil and above ground in the trees that were planted through the project. Resource monitoring methodologies were developed which were used to measure carbon sequestration and biodiversity conservation. Carbon stocks

[4] A large percentage of income from PES was generated through land use changes with live fences and high density trees in pastures.

measured in silvopastoral habitats were higher than in degraded lands, and emission of green house gases was found to be lower in silvopastoral habitats: the model developed to evaluate GHG emissions and carbon budget showed that the use of high quality forage such as *leucaena* reduced methane emissions and the use of nitrogen fertilizers on pastures reduced N_2O emissions.

As discussed earlier, each country has adopted different approaches to further project interventions, an indication of the projects ability to adapt to varying circumstances. In the three countries, land use has not reverted back to the original use prior to the implementation of the PES scheme.

All of these successes would not be possible were it not for another outcome of the project. Namely, that the project has been instrumental in increasing the awareness of the potential of integrated ecosystem management has on providing critical environmental services including the restoration of degraded pasture. This has been achieved through extensive training, capacity building and dissemination of knowledge generated through the project. Experts from CATIE continue to participate in international events presenting project results, including a GEF-organized workshop on land degradation and desertification in Tunis. This knowledge base is serving to provide guidance for replicating the Silvopastoral System at all levels as discussed in Section 2.5.

3.3 Efficiency

The Silvopastoral Project had relatively high costs due to its intensive monitoring, capacity building and other activities normally not a part of a scaled-up non-experimental project. The Environmental Services Index served an important function in providing a means to measure and account for the environmental services being provided by farmers. It also leveled the playing field in the sense that anybody participating in the payment scheme had an objective assessment of their starting point. They did provide valuable information that allowed for a better appreciation of the costs and benefits of applying silvopastoral systems (SPS).

Project hypotheses were tested and silvopastoral systems proved to be profitable for farmers (productivity increased as stocking rates and animal conditions improved, and costs related to herbicide use and soil erosion, among others, decreased). As explained earlier, the sustainability of systems that are win-win is easy to comprehend as farmers adopt practices that are not only beneficial for the environment, for example, but also for their bottom line. There are situations however where adopting a SPS practice while providing a greater public good is not necessarily in the best financial interest of the farmer. In these cases a continuous payment would need to be made in order to make this practice more attractive than the current alternative. Economic analysis in Esparza, Costa Rica showed that different combinations of silvopastoral practices for dual purpose cattle ranching present IRR which varies from 14%, for a system of natural pasture with a fodder bank, to 37% for a system with improved pasture and low density of trees. These numbers were corroborated with analysis in Colombia and Nicaragua and also in other countries that are experimenting with silvopastoral systems such as Guatemala (see Annex 3). At these rates of return farmers do not need an incentive to adopt them. In fact, in Colombia and Nicaragua farmers are willing to borrow from a special line of credit for SPS practices.

It was also shown that SPS serve to enhance biodiversity restoration and conservation, carbon sequestration, soil recovery and improve water quality. The project proved that PES is a useful tool to induce land use changes from simple, degraded pastures to biodiversity-friendly SPS, providing a sustainable economic option for a more environmentally friendly cattle ranching. In

addition, the project showed that in order for land use changes to be more rapidly adopted, technical assistance and loan availability must be provided.

As for project management, GEF and co-financing resources were used in an efficient manner, enabling not only the demonstration of initial hypothesis, but also generating information and mechanisms to scale up operations in each country (see Section 2.5).

3.4 Justification of Overall Outcome Rating

Overall Outcome Rating: Satisfactory

This ICR rates the project as **Satisfactory** considering that it reached its key targets and objectives. The development of the methodologies developed by the project has enabled Colombia, Nicaragua and Costa Rica to attain: a) incremental environmental benefits such as erosion reduction, improvement in water quality, increased on-farm production with a reduced input footprint (fertilizer and pesticides); b) incremental global environmental benefits such as improved biodiversity and carbon sequestration; c) an enhanced experience and exposure by farmers to a payment for environmental services scheme, as is evident in all three countries where the demand for the continuation of the program is high among farmers. The project also created the biodiversity index serving to differentiate payments according to farmers' increasing willingness to adopt biodiversity-friendly measures. Its rich dataset on biodiversity indicators has become a widely available tool for measuring biodiversity in agricultural landscapes.

The silvopastoral project's main achievement has been not only to attain these important outcomes, but also to raise awareness on the possibility of matching environmental objectives with cattle farming. Through very effective dissemination and capacity building strategies at all levels, from the farmer to the technician to the politician, including the researcher[5], project partners have promoted the inclusion of mechanisms to continue supporting SPS in the three countries. This lays out alternatives that other countries can analyze and adapt to their reality.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

The project has demonstrated that with silvopastoral systems farmers can be significantly better off. The techniques introduced and adopted on the farm have reduced input requirements (including fertilizer and pesticides) and ultimately improved productivity. In Nicaragua it was shown, for example, that milk production in participating farms has increased from 3.4 liters/cow to 3.7 liters/cow and stocking rates have increased from 1.5 to 2.0 livestock units per ha[6]. However, the system requires a significantly higher investment to implement. Not all farmers, and in fact, most do not have the capital necessary to accommodate these high initial costs. The payment for environmental services component has proven instrumental in making the difference in "tipping" farmers into adopting the system. The analysis throughout the life of the project has shown that poor and extremely poor households accounted for a substantial share of land use changes. Although larger farms received more for PES than small and medium-sized farms, the latter had higher amount of PES/ha compared to larger farms, in particular in Costa Rica and Colombia.

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5 Graduate students also participated in the development of methodologies for monitoring and evaluation: 10 master's and 2 doctoral students undertook their thesis on the project, based in CATIE.

6 Pagiola, et al. 2007

Regarding socioeconomic development, the final report prepared by CIPAV concludes that SPS are the most profitable cattle ranching alternative when compared to traditional extensive ranching in Colombia. It generates higher income which was found to be sustainable in the short to medium term even though there is a need for high initial investment[7].

(b) Institutional Change/Strengthening
Even though the institutions chosen to work on the project were already well established and solid organizations, their association with the project has enhanced their ability to work on the agriculture-environment nexus. Staff of all three institutions was positively affected by the intra and inter-institutional interactions and the capacity building opportunities the project offered. These activities strengthened their collaboration with national and regional institutions such as CRQ in Colombia, FONAFIFO in Costa Rica and FDL in Nicaragua and with the private sector (FEDEGAN in Colombia, NESTLE and CORFORGA of Costa Rica and Rainforest Alliance).

(c) Other Unintended Outcomes and Impacts (*positive or negative, if any***)**
Knowledge transfer – The lessons learned, methodologies developed and experiences from the project are being disseminated in each project country, the region and around the world. This could easily be one of the most prolific projects the GEF may have supported with over 70 reports, studies, refereed journal articles and books. Presentations were made in local and international fora.

At the local level, farmers shared the knowledge they received through technical assistance amongst peers and broader networks, creating a wider distribution than would have been possible with the extension services alone. This created a difficult to control leakage issue for the experimental design. However, the sharing of knowledge was felt to be a far greater good than the missed opportunity of a perfect experiment. The GEF *Mainstreaming Biodiversity in Sustainable Cattle ranching* project currently under preparation, will be regionally anchored in FEDEGAN's technical assistance units (TECNIGANES). These have traditionally transferred technology focused on cattle ranching in improved pastures without trees, but in preparation for the scaling up operation are now being trained in SPS. This will result in one of the strongest multiplier effects of the regional project: promoting SPS beyond direct beneficiaries and disseminating them as best productive practice throughout the entire cattle ranching association. Technical assistance will be provided to producers in surrounding project areas who, although not benefitting from PES, may be interested in partially adopting SPS.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

The project carried out informal stakeholder workshops in each of the countries to evaluate results. During these events technical staff discussed the project with farmers and involved institutions. Main findings include: i) PES and technical assistance (TA) are equally important for producers. Without TA, they do not feel confident enough to embark on adopting new technologies; ii) farmers prefer 4-year payment schemes as this enables them to accumulate knowledge in the SPS and more progressively invest in their adoption; iii) the introduction of SPS is positively valued by farmers, who expressed their intention not to return to previous farm management practices; and iv) producer-to-producer visits played an important role in introducing farmers to the benefits of SPS. In general, farmers were highly satisfied with project

[7] CIPAV. Enfoques Silvopastoriles Integrados para el Manejo de Ecosistemas. Reporte Final – Colombia. 2008.

outcomes including those in the 2-year payment scheme. A detailed description of these discussions can be found in Annex 6.

4. Assessment of Risk to Development Outcome

Rating: Negligible or Low

As discussed earlier, the project has already generated concrete actions in all three countries to scale up project activities, in addition to transferring knowledge throughout the region and the world. The long-term sustainability of project outcomes is made more likely by the strength of the institutions involved in its implementation and the solid analytical work that resulted, demonstrating that in fact SPS are both economically and environmentally sound. The continuation of the analytical work by these institutions will build up additional evidence in support of the adoption of the silvopastoral systems in productive farms everywhere.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

Rating: Satisfactory

The Bank's participation in the design of the project was of key importance. The role of the international experts brought in to support its technical and financial preparation cannot be overstated. This, in association with in-house expertise from the three implementing agencies, led to a project design which has ultimately resulted in a successful project conclusion. This is a testament to the quality at entry given the very innovative nature of the project and the unchartered waters that were navigated.

(b) Quality of Supervision

Rating: Satisfactory

The Bank's team was highly qualified and maintained a high level of participation throughout the various supervision missions. If not physically present, they were connected to the field teams through constant communication and technical exchanges. This collaboration flourished and is evident in the rich series of papers, reports and books that were produced over the course of the project's life.

Weak counterpart fiduciary implementation issues were identified in the Procurement Officers visit resulting in the downgrading of the Procurement IP to Unsatisfactory in the December 2003 ISR. The task team recognized the need for closer supervision and quickly followed by adding one supervision mission and maintaining closer contact on fiduciary aspects. A knowledgeable procurement professional subsequently hired by CATIE was able to train local CATIE, CIPAV, FONAFIFO and NITLAPAN staff. After working closely with the counterparts on these issues these aspects improved significantly and the IP rating was upgraded to Satisfactory on April, 2005.

Bank senior management followed the project closely, in part for its innovativeness and the potential this had for future work in the agriculture-environment nexus. Management was briefed on developments including a presentation during the WB's Sustainable Development Week in 2008, where the project was selected as a best implementation practice to be included in the World Development Report focusing on Rural Development.

(c) Justification of Rating for Overall Bank Performance
Rating: Satisfactory
Despite issues that are to be expected for such an innovative project, the Bank was responsive and maintained a highly technical team engaged in the project from design through completion. Management was also actively participating through close oversight and providing guidance and the necessary resources for implementing a project with so many new attributes. FAO-LEAD also provided technical support in the design and implementation of the project.

5.2 Borrower
(a) Government Performance
Rating: Satisfactory
As would be expected each of the three governments had a different response to the project and its implementation. There was an adequate contribution from each government during preparation, although most of the support was delegated to the appointed implementing agency.

(b) Implementing Agency or Agencies Performance
Rating: Satisfactory
During preparation the three countries through their appointed implementing agencies contributed significantly to the design of the project. All three institutions in Colombia (CIPAV), Costa Rica (CATIE) and Nicaragua (NITLAPAN-UCA) were actively involved. Their experience with agriculture production systems, natural resource management, research, analytical methods and financial systems were all fundamental to a better designed project. As overall implementation coordinator, CATIE provided technical support during project design and execution using the expertise gained, among others, through projects such as the EU-funded FRAGMENT and Mesoamerican Biological Corridor, which generated information on biodiversity it contributed to methodological developments.

Although CATIE's previous experience with several Bank projects had familiarized it with WB procedures, six months after effectiveness a Bank mission detected deficiencies in procurement. This, along with difficulties in obtaining the signatures for the subsidiary agreements with the two co-executing agencies (CIPAV and NITLAPAN) delayed initial implementation which resulted in a disbursement lag. CATIE quickly moved to hire a procurement specialist who then trained the staff responsible for fiduciary aspects in Costa Rica, Colombia and Nicaragua. Eventually, the project was back on track and by end of project the disbursement lag had been eliminated with a full disbursement.

(c) Justification of Rating for Overall Borrower Performance
Rating: Satisfactory
All three governments have shown strong support for the project and plan to continue supporting it. The new instruments being proposed and new projects being prepared incorporating many of the methods developed by the project is a strong indication of this support. Despite an initial steep learning curve (as would be expected with such an innovative project) the silvopastoral project is a success story that is being shared with the rest of the world.

6. Lessons Learned

As a pilot project, the Silvopastoral Project has generated a tremendous amount of learning. These lessons are being incorporated into the design of the follow-on projects discussed earlier. It has clearly demonstrated that:

- **Farmers respond to PES.** At each of the project sites, the project has induced substantial land use change – far more than in the control groups, in terms of both area affected and the extent of changes undertaken.
- **Silvopastoral practices generate substantial benefits in terms of:**
  - **biodiversity conservation:** substantial increases in biodiversity in project-supported land uses were observed at all sites; among other indicators, both the number of species of birds observed and the number of individuals increased, including many forest-dependent and endangered species.
  - **carbon sequestration:** the silvopastoral practices supported by the project resulted in substantial carbon sequestration, both directly (un sequestering carbon in trees) and indirectly (by inducing lower applications of nitrogen fertilizers and, through improved nutrition, reducing methane emissions from livestock).
  - **water services:** monitoring of water quality at the Colombia site show a rapid drop in turbidity, biological oxygen demand (BOD), and coliform counts when riverbanks are reforested and protected from livestock entry, as well as the return of invertebrates indicative of unpolluted water.
- **Some silvopastoral practices can be highly profitable for farmers.** Even in the short period that has already elapsed since the last payment under the project, for example, farmers in Quindío have continued to adopt silvopastoral practices such as intensive leucaena systems. The specific practices that have proved most attractive have varied from case to case, depending on the local context. In Quindío, intensive silvopastoral practices based on leucaena have proven most attractive to farmers, while in Esparza the farmers' preferences was for improved pastures with high tree density.
- **Highly profitable silvopastoral practices for farmers imply that mechanisms such as PES are not always needed to induce their adoption**. In many cases, some initial support in overcoming the initial costs of adoption may be sufficient. Given the high profitability of these practices, this support could take the form of credit. TA can also play a very useful role in helping farmers select the silvopastoral practices most suited to their conditions and the implement them correctly.
- However, it is also evident that some practices, including some that are very attractive from a biodiversity perspective (such as establishing riparian forests) are less attractive to farmers. Moreover, some of the practices that are most attractive to farmers, such as intensive leucaena, are not necessarily very beneficial to biodiversity unless established in association with multi-species live fences.
- **Approaches to future projects.** These results suggest that, in many cases, silvopastoral practices can play an important role in rural development efforts. Future efforts to expand the adoption of silvopastoral practices should not necessarily be seen as primarily environmental projects that also have rural development benefits, but rather as primarily rural development projects that also have environmental benefits. That many of the environmental benefits generated are global in nature means that GEF support for such projects would often be justified.

Methodological lessons

- **Apply the environmental service and biodiversity indexes.** The indices developed by the project were very useful tools that farmers quickly related to. They were able to relate their activity to a direct level of compensation, allowing each individual to reach his or her own

comfort level. Contracts with farmers specifying amounts per land use change made annual payments easier.

- **Simplify the application of the indices.** Monitoring the different land uses had a high transaction cost, although it was important to evidence intervention impacts and promote their scaling up. A simplified tool having similar impacts will be tested in the Colombian follow-up operation, where land uses are aggregated into 9 categories for ES valuation, down from the original 28.
- **Land use index is a good proxy for PES.** There was a high correlation between the indicators measured for on-site biodiversity and carbon with the values assigned to the ecological index, an indication that the land use index was a good proxy for PES. The index had to be adjusted only for overestimated values assigned to fodder banks, as they were frequently harvested.
- **Determine reliable biodiversity predictors.** The project has developed a large database on biodiversity and found two main variables explaining its presence: diversity of tree species and tree cover. These variables can therefore be used to predict biodiversity along with landscape connectivity.
- **Empower farmers to be a voice for the project.** Farmers trained by the project were dissemination agents outside intervention areas, resulting in greater adoption of silvopastoral systems.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

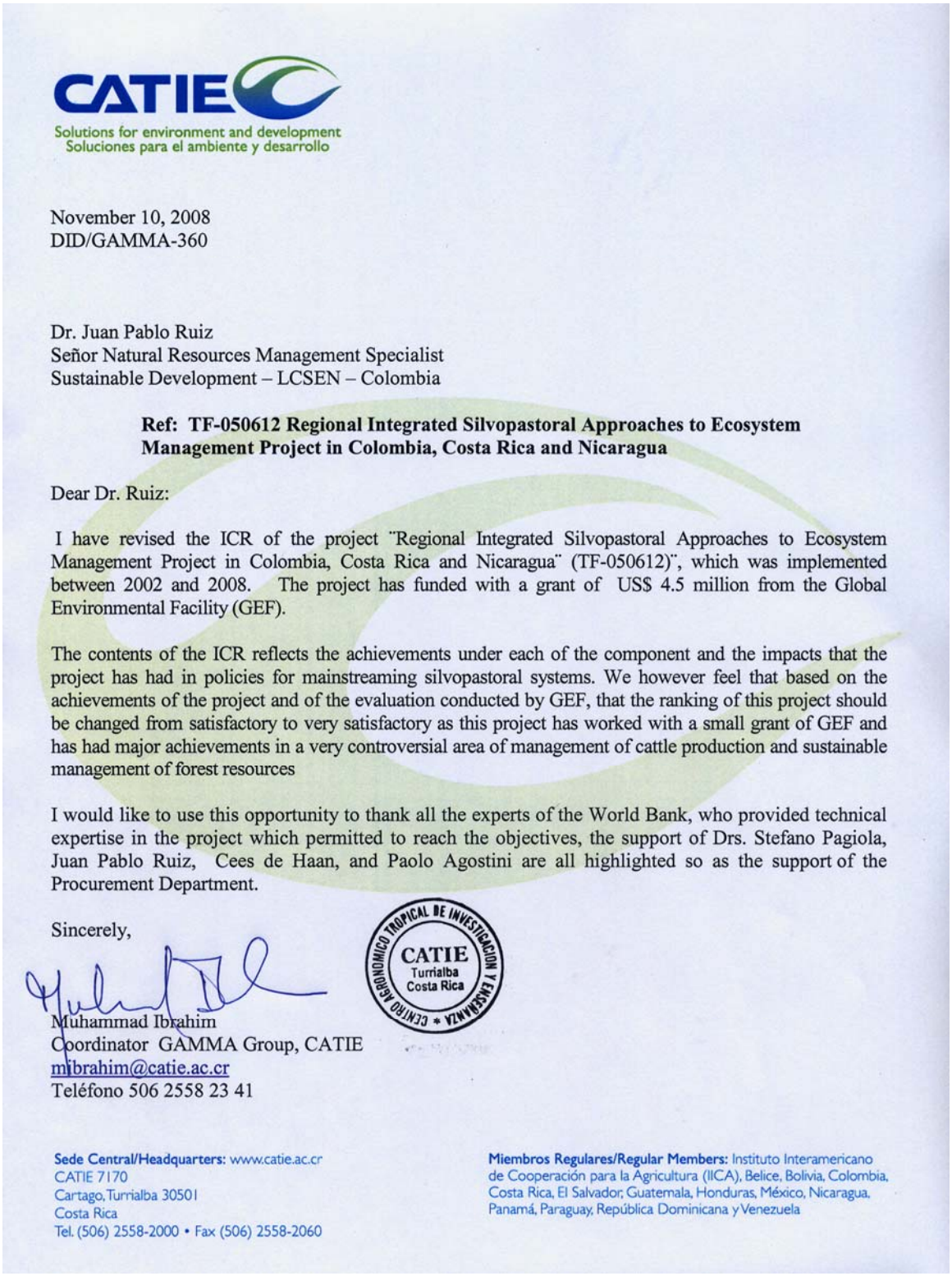
The Coordinator of the GAMMA Group and former Coordinator of the project for CATIE, Mr. Muhammad Ibrahim conveyed to the World Bank CATIE's comments on the ICR in a letter dated November 10, 2008.

The following is an excerpt of the section of the comments pertaining to their review of the evaluations (the letter is attached below in Figure 1).

"The contents of the ICR reflects the achievements under each of the component and the impacts that the project has had in policies for mainstreaming silvopastoral systems. We however feel that based on the achievements of the project and of the evaluation conducted by GEF, that the ranking of this project should be changed from satisfactory to very satisfactory as this project has worked with a small grant of GEF and has had major achievements in a very controversial area of management of cattle production and sustainable management of forest resources".

(b) Cofinanciers and Other partners and stakeholders

Comments requested from cofinanciers and other partners such as LEAD-FAO were not received in time for inclusion in the ICR.



CATIE
Solutions for environment and development
Soluciones para el ambiente y desarrollo

November 10, 2008
DID/GAMMA-360

Dr. Juan Pablo Ruiz
Señor Natural Resources Management Specialist
Sustainable Development – LCSEN – Colombia

Ref: TF-050612 Regional Integrated Silvopastoral Approaches to Ecosystem Management Project in Colombia, Costa Rica and Nicaragua

Dear Dr. Ruiz:

I have revised the ICR of the project "Regional Integrated Silvopastoral Approaches to Ecosystem Management Project in Colombia, Costa Rica and Nicaragua" (TF-050612)", which was implemented between 2002 and 2008. The project has funded with a grant of US$ 4.5 million from the Global Environmental Facility (GEF).

The contents of the ICR reflects the achievements under each of the component and the impacts that the project has had in policies for mainstreaming silvopastoral systems. We however feel that based on the achievements of the project and of the evaluation conducted by GEF, that the ranking of this project should be changed from satisfactory to very satisfactory as this project has worked with a small grant of GEF and has had major achievements in a very controversial area of management of cattle production and sustainable management of forest resources

I would like to use this opportunity to thank all the experts of the World Bank, who provided technical expertise in the project which permitted to reach the objectives, the support of Drs. Stefano Pagiola, Juan Pablo Ruiz, Cees de Haan, and Paolo Agostini are all highlighted so as the support of the Procurement Department.

Sincerely,

CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA
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Miembros Regulares/Regular Members: Instituto Interamericano de Cooperación para la Agricultura (IICA), Belice, Bolivia, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, México, Nicaragua, Panamá, Paraguay, República Dominicana y Venezuela

Figure 1 - Comments on ICR by Implementing Agency CATIE

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
ECOSYSTEM ENHANCEMENT'S EXTENSION SERVICES AND CAPACITY BUILDING	**4.80**	**5.40**	**112**
MONITORING AND EVALUATION OF ECOLOGICAL SERVICES	**0.95**	**2.30**	**242**
ECOSERVICES PAYMENTS	**1.40**	**1.50**	**107**
POLICY FORMULATION AND DISSEMINATION	**0.30**	**0.30**	**100**
PROJECT MANAGEMENT	**1.00**	**2.04**	**204**
Total Baseline Cost	**8.45**	**11.54**	**136**
Physical Contingencies	0.00		
Price Contingencies	0.00		
Total Project Costs			
Project Preparation Facility (PPF)	0.00		
Front-end fee IBRD	0.00		
Total Financing Required			

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower		0.00	0.00	0.00
Global Environment Facility (GEF)		4.50	4.50	100.00
Local Farmer Organizations		3.00	4.00	133.00
Foreign Multilateral Institutions (unidentified)		0.35	0.35	100.00
Non-Government Organization (NGO) of Borrowing Country		0.60	2.69	440.00

Annex 2. Outputs by Component

Component 1: Ecosystem Enhancement and Capacity-building

This component addressed the need to strengthen local organizations to train and assist farmers in the introduction of silvopastoral systems and more generally, support them in management of sustainable livestock production systems and integrated ecosystems. Table 1 shows outputs achieved compared to targets included in project design and reported in its Implementation Status Reports (see Section F). Additional notes complement information provided in the table.

Table 1. Outputs achieved for Component 1

	Original Targets (or as adjusted by MTR)	Actual Target Achieved
1	About 4,000 hectares of silvopastoral systems established, improving the ecosystem in at least 12,000 ha. to demonstrate the benefits of silvopastures for carbon sequestration and biodiversity in three countries	3,673.2 hectares of silvopastoral systems established, improving the ecosystem in 12,260 ha. to demonstrate the benefits of silvopastures for carbon sequestration and biodiversity in three countries
2	Increased biodiversity in the pilot zones in three project countries: - 26 bird species in secondary and riparian forests in Costa Rica; 74 in Colombia; and 40 in Nicaragua - 67 butterfly species - 35 mollusk species	Increased biodiversity in the pilot zones in three project countries: - 42 bird species in secondary and riparian forests in Costa Rica; 104 in Colombia; and 51 in Nicaragua - 130 butterfly species - 81 mollusk species
3	Increased carbon sequestration (about 25,000 ton carbon sequestered per year)	Increased carbon sequestration (about 19,558 incremental ton carbon sequestered by project end)
4	Increased water quality in watersheds (reduction on Biochemical Oxygen Demand and Suspended Total Solids mg/l)	Increased water quality in watersheds (reduction on Biochemical Oxygen Demand and Suspended Total Solids)*
5	Increased socioeconomic impact – Income in pilot farms increased by 10 percent during project's duration: - US$162 income per ha. (revenues minus direct costs) in Costa Rica - US$440.8 income per ha. in Colombia - US$111.2 income per ha. in Nicaragua	Increased socioeconomic impact – Income in pilot farms increased by 10 percent during project's duration: - US$252 income per ha. in Costa Rica - US$1,597 income per ha. in Colombia - US$180 income per ha. in Nicaragua

* Note 1: Water quality was monitored in Colombia, where the following indicators were tracked:

Indicator[8]	Baseline value	Actual value by completion	Accepted values for protected watersheds
BOD (ppm)	11	<1.2	< 5
Turbidity (NTU)	> 40	9.2	< 10
EPT (%)	0	27	> 20

[8] NTUs measure the intensity of light scattered at 90 degrees as a beam of light passes through a water sample. The World Health Organization established that the turbidity of drinking water should not be more than 5 NTUs, and should ideally be below 1 NTU.
EPT percent measures the percent of macro-invertebrates sensitive to pollution

Component 2: Monitoring Environmental Services

This component prepared and implemented a system to monitor changes in land use, carbon sequestration, biodiversity, and water quality to provide accurate data and understanding of the potential of silvopastoral systems in the provision of global environmental services and local socioeconomic benefits. Table 2 shows outputs achieved compared to those targets included in project design. Additional notes complement information provided in the table.

Table 2. Outputs achieved for Component 2		
	Original Targets (or as adjusted by MTR)	**Actual Targets Achieved**
6	Methodologies to assess biodiversity, carbon sequestration, water quality on farm, watershed and community level an socio-**economic impact developed and tested**	Methodologies to assess biodiversity, carbon sequestration, water quality on farm, watershed and community level an socioeconomic impact developed and tested** .
7	Monitoring systems for biodiversity conservation, carbon sequestration, water quality using biological indicators and socio-economic impact established (monitoring systems in 3 countries)	Monitoring systems for biodiversity conservation, carbon sequestration, water quality using biological indicators and socio-economic impact established (monitoring systems in 3 countries)[9]

** Note 2: An environmental service index was developed by project, ranking each of the 28 land uses identified in farms in terms of their contribution to carbon sequestration and biodiversity conservation. Changes were monitored through GIS images and the index was used to determine incremental points to be paid to participating farms. Water quality was monitored in Colombia with community participation for the variables described in Table 1 above (a similar methodology was also developed in Costa Rica), and 30 farms in each country were monitored for productivity and socioeconomic impacts, with the following results:

Socio-economic Improvements	***Baseline Value***	***Actual Value Achieved***
Net income per hectare-livestock prod(US$)	237.7	888.5
Mean soil erosion (tons/ha)	80.9	44.1
Avg. milk production (daily liters per cow during summer)	5.0	6.1
Avg. Stocking rate (animals per ha.)	1.8	2.5
Fire (% farms that use fire)	38.0	2.3
Labor demand (No. man per day)	52,719.5	69,423.6
Use of Herbicides (liters)	13,913.6	7,899.9

[9] Training on monitoring methodologies was provided to local experts in 3 countries; 11 graduate students (1 at the doctoral level) undertook their thesis on project-related research.

Component 3: Eco-services payment

This component assessed beneficiaries' response to investments for biodiversity conservation and carbon sequestration in farms producing global environmental benefits. An eco-services payment scheme was developed and implemented in 265 farms in three countries, divided into two groups per country: those receiving payments for 2 and 4 years respectively with differentiated values for incremental ecological points, within which some farms received technical assistance and others did not. Table 3 shows outputs achieved compared to those targets included in project design. Additional notes complement information provided in the table.

Table 3. Outputs achieved for Component 3

	Original Targets (or as adjusted by MTR)	Actual Targets Achieved
8	Eco-service payment systems implemented in each of the target countries	Eco-service payment systems implemented in each of the target countries (265 farms participated in PES scheme until completion)
9	Certification of ecological services conferred (results of monitoring analyzed at farm and landscape level, and environmental services paid to the farmers)	Certification of ecological services conferred - PES awarded per farm until completion totaled US$2,500 in Costa Rica, US$2,300 in Colombia and US$2,400 in Nicaragua
10	Farmers and community reaction to environmental services incentives and change of attitude and perception to local and global environment measured (measured by changes on land use, in particular in area set aside for forest regeneration)	Farmers and community reaction to environmental services incentives and change of attitude and perception to local and global environment measured*** – See table below for variations in land use changes

*** Note 3: Studies were carried out to assess farmer perception of PES scheme, resulting in the majority of farmers understanding the concept of PES and satisfied with the amount of money received, which they knew was for a service provided and not a subsidy.

Land uses monitored in project farms showed the following variations, whereby those least environmentally-friendly decreased and those most desirable from a biodiversity perspective increased:

Land use	% of total has. per land use type		Variation 2003 – 2007
	2003	2007	
Degraded Pastures	17,5	5,6	-12,0
Natural Pastures	8,9	2,9	-6,1
Improved Pastures	12,9	10,4	-2,5
Natural Pastures w/ Trees	16,5	13,1	-3,4
Improved Pastures w/ Trees	9,1	30,7	21,6
Fodder banks	1,1	3,1	2,1
Natural Succession	2,9	2,8	- 0,1
Forests	21,7	22,4	0,7
Intensive SPS	0,1	1,4	1,3
Other	9,3	7,7	-1,3
Live fences (km)	354,6	1.341,9	278,3 %

Total area: 2003 – 12,276.5 ha; **2007** – 12,262.1 **Source:** Project Indicators 2007

Component 4: Policy formulation and dissemination

Table 4 shows outputs achieved compared to those committed in the original project design or as adjusted during its implementation. Additional notes complement information provided in the table.

Table 4. Outputs achieved for Component 4		
	Original Targets (or as adjusted by MTR)	**Actual Targets Achieved**
11	Socioeconomic data available on key factors affecting farmer adoption of silvopastoral systems	5 studies on barriers to the adoption of SPS systems were developed (3 in Costa Rica, 1 in Colombia and 1 in Nicaragua) with 1 socioeconomic baseline per country was developed – barriers identified include high investment for SPS set up and high labor demand for intensive SPS management (in cut and carry systems)
12	Alternative sources of funding for payment for eco-services, and alternative measures to promote silvopastoral systems identified and secured	18 policy initiatives promoting silvopastoral systems and funding for PES were proposed (7 in Costa Rica; 5 in Colombia; 6 in Nicaragua) 4 of which implemented (3 in CR and 1 in Colombia)
13	Specific recommendations for best ranching practices and land use that improve habitat heterogeneity to sustain higher biodiversity, and increase ranch yield disseminated among minimum 1200 farmers, 12 NGO's and/or community-based groups, policy-makers and regional networks	Specific recommendations for best ranching practices and land use that improve habitat heterogeneity to sustain higher biodiversity, and increase ranch yield disseminated amongst 5,097 farmers, 77 NGO's and/or community-based groups, policy-makers and regional networks

Annex 3. Economic and Financial Analysis

The Regional Integrated Silvopastoral Approaches to Ecosystem Management Project is the first GEF supported project to apply silvopastoral practices associated with payment for environmental services. A financial analysis was undertaken during preparation which sought to clarify whether investments in silvopastoral systems are financially viable and to ascertain the impact of payments for environmental services. This was done by conducting a benefit cost analysis for seven different models of representative farms with different livestock production systems in Colombia, Costa Rica and Nicaragua (Gobbi, 2002).

To assess the financial viability and social benefits of the project, the Internal Rate of Return (IRR), the Net Present Value (NPV) and the increased labor demands were estimated for the most likely farm models in the three countries. As shown in Table A-5.1, the analyses of financial returns provided by the introduction of the silvopastoral system showed a marginal profitability for almost all models. The financial analyses also showed that in the absence of payment for global environmental benefits, the IRR was lower than the opportunity cost of capital in all cases. The initial investment and labor costs in the technology, with the delay in the results, were determined as the main causes of this result. However, only modest payments for the global environmental benefits would be required to tip the balance to financial viability.

Table A – 5.1: Financial returns of different farm models (w/ & w/o) payment for environmental services – beginning of project

Farm model	Farm size	Increased labor requirements (% increase over base)	IRR (%), without payment for environmental services	IRR (%), with payment for environmental services
Colombia				
Extensive, beef	Medium (50-80 ha)	12	8	15
Semi-intensive, beef	Small (15-30 ha)	13	13	15
Intensive beef	Small (10-20 ha)	8	13	19
Costa Rica				
Dual-purpose: milk/beef	Small (30-40 ha)	34	7	16
Nicaragua				
Dual-purpose: milk/beef	Small (10-30 ha)	86	7	12
Dual-purpose: milk/beef	Small (30-60 ha)	59	9	14
Dual-purpose: milk/beef	Large (>60 ha)	106	8	14

Follow-up economic analysis, done towards the end of the project revealed IRRs and NPV which were higher than these initial numbers proving the financial viability of the silvopastoral system. An economic analysis in Esparza, Costa Rica showed that different combinations of silvopastoral practices for dual purpose cattle ranching present IRR which varies from 14%, for a system of natural pasture with a fodder bank, to 37% for a system with improved pasture and low density of trees. The following table summarizes these results.

Table A–5.2: Financial returns of different farm models (w/ & w/o) payment for environmental services – Esparza, Costa Rica – end of project				
Farm Model*	**IRR (%) w/o PES**	**IRR (%) w/ PES**	**NPV w/o PES**	**NPV w/ PES**
Improved pasture with low tree density	22	37	260	468
Improved pasture with fodder bank	13	14	78	96
Improved pasture with 20% tree coverage	23	35	331	492
Live fence	16	38	73	211

* All model alternatives were natural pastures. The live fence compared against the traditional method of using poles.

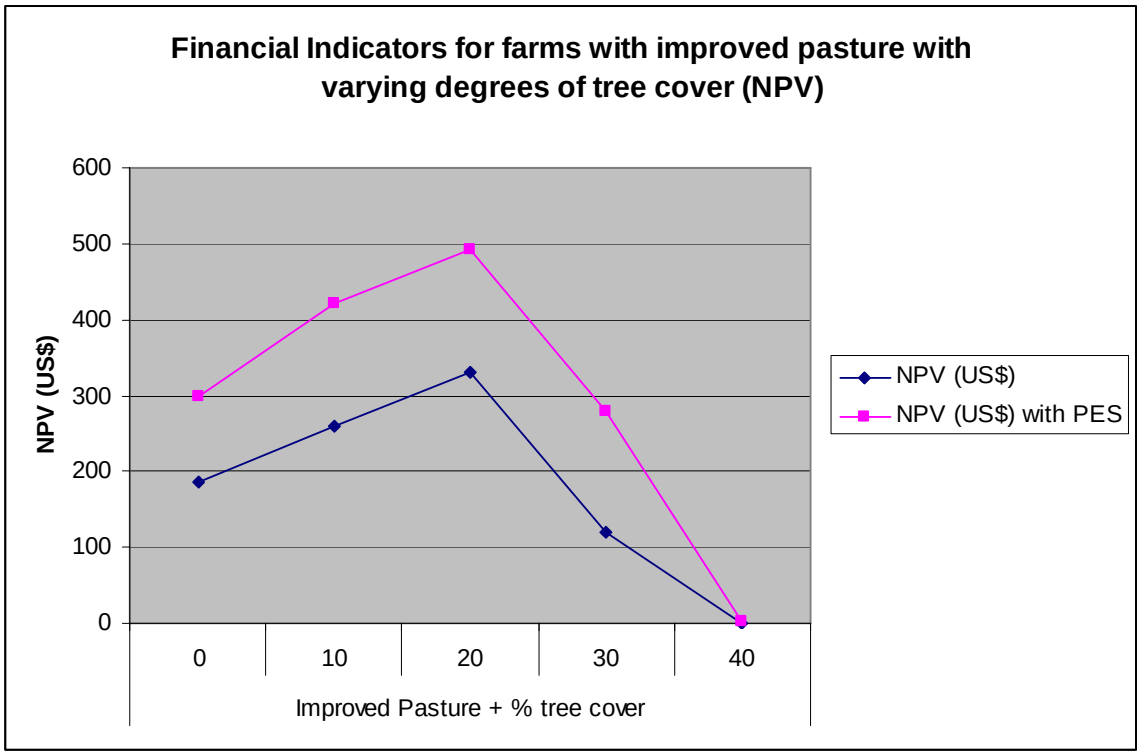
The analysis that was carried out throughout the course of the project and which continues to date with several other research projects was able to provide results which helped debunk some of the myths that farmers had about tree cover. Amongst cattle farmers there exists the notion that the cleaner the pasture the more productive it is. Trees are seen as an impediment to increasing herd size and thereby greater profits. The following table depicts the clear improvement on all productive indicators when compared to a farm with only natural pasture. It is to be expected that tree cover at some point will start to diminish a pastures carrying capacity as depicted for all corresponding indicators (animal units, liters milk and kg of meat). In this case this happens between 20 and 30% tree cover. Naturally timber volume will increase the higher the coverage.

Table A – 5.3: Productivity indicators for farms with improved pasture with varying density of tree cover						
Indicator	**Natural Pasture**	**Improved Pasture (IP)**	**IP + 10% tree cover**	**IP + 20% tree cover**	**IP + 30% tree cover**	**IP + 40% tree cover**
AU/ha/yr*	0.8	1.4	1.4	1.3	1.1	0.8
lt milk/ha/yr	608	960	960	1017	860	704
kg meat/ha/yr	106	152	152	161	136	111
m^3 timber/ha	0	0	9	27	32	51

* - AU – Animal Unit

These production indicators have a direct corollary in the corresponding financial indicators (Table A-5.4). The Improved Pasture with 20% tree cover provides the greatest return to the investment in a silvopastoral system as can be clearly visualized in the graph shown below.

Table A – 5.4: Financial indicators for farms with improved pasture with varying density of tree cover					
Indicator	**Improved Pasture (IP)**	**IP + 10% tree cover**	**IP + 20% tree cover**	**IP + 30% tree cover**	**IP + 40% tree cover**
IRR (%)	21	21	23	18	-
IRR (%) with PES	30	33	35	32	8
NPV (US$)	185	260	331	119	-
NPV (US$) with PES	300	422	492	280	2

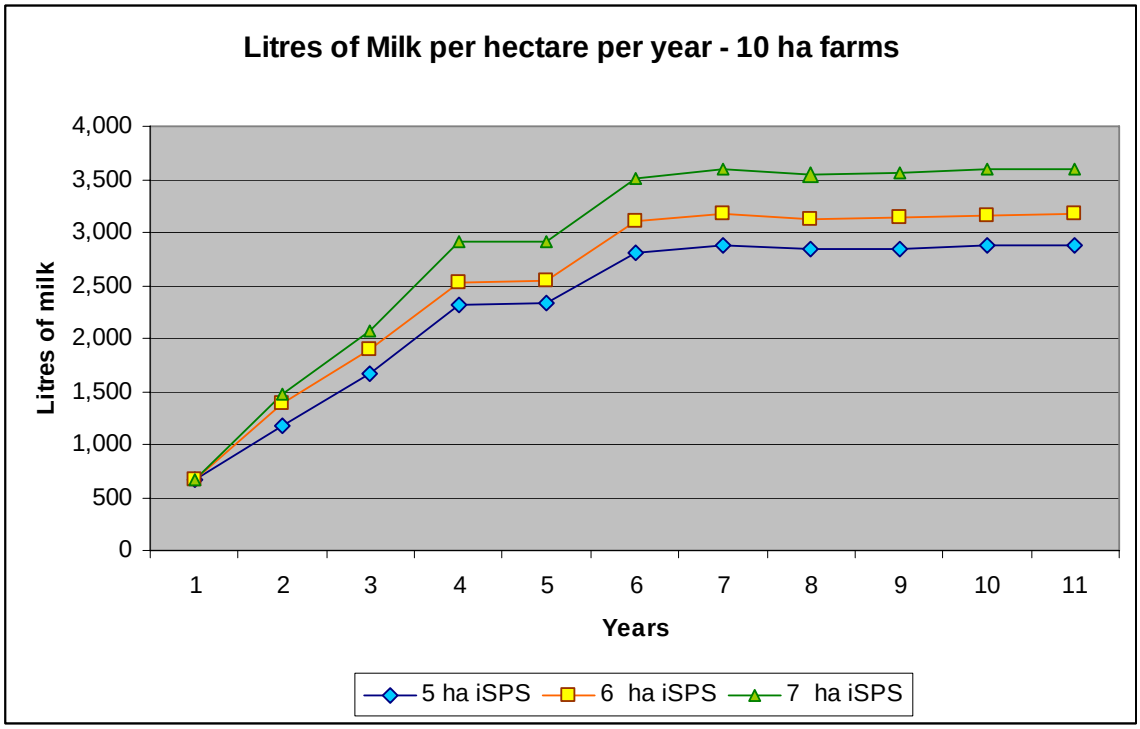


Research in the Cauca Valley and Caribbean region of the Magdalena River has shown positive results for high tree density (≥ 10,000/ha) rotational pastoral system which allows for more than 4 dairy cows per hectare per year. They have shown the advantages of planting leucaena (*Leucaena spp.*) in association with Arizona (*Prosopis julifolora)* and improved pasture (*Cynodon plestostachyus*, *Panicum maximum*) over nitrogen fertilized monoculture pasture (Lafaurie, J.F. et al., 2007). This intensive silvopastoral system (iSPS) has also been shown to have the added positive results of: 1) reducing greenhouse gases through the complete elimination of the application of nitrogen based synthetic fertilizers (urea and others); 2) reducing dependency or elimination of concentrated feed; and 3) the capacity to store carbon in the soil and in the above ground biomass (Ibrahim, M. et. al., 2007). Other documented positive results from intensive silvopastoral systems and reforestation refer to the positive effects on regulation of flow and quality of water in Andean micro-catchments. This intensive system demonstrates what is possible. It is not the norm as the high initial capital costs are not easily surmounted, especially for a small farmer.

Farms 10 hectares and smaller, that change land use from degraded pasture to intensive silvopastoral production systems with Leucaena, mixed fodder banks and sugar cane, can see threefold increases in their land's cattle carrying capacity. This implies a 294% increase of the herd, an almost 400% increase in the number of cows that are lactating.

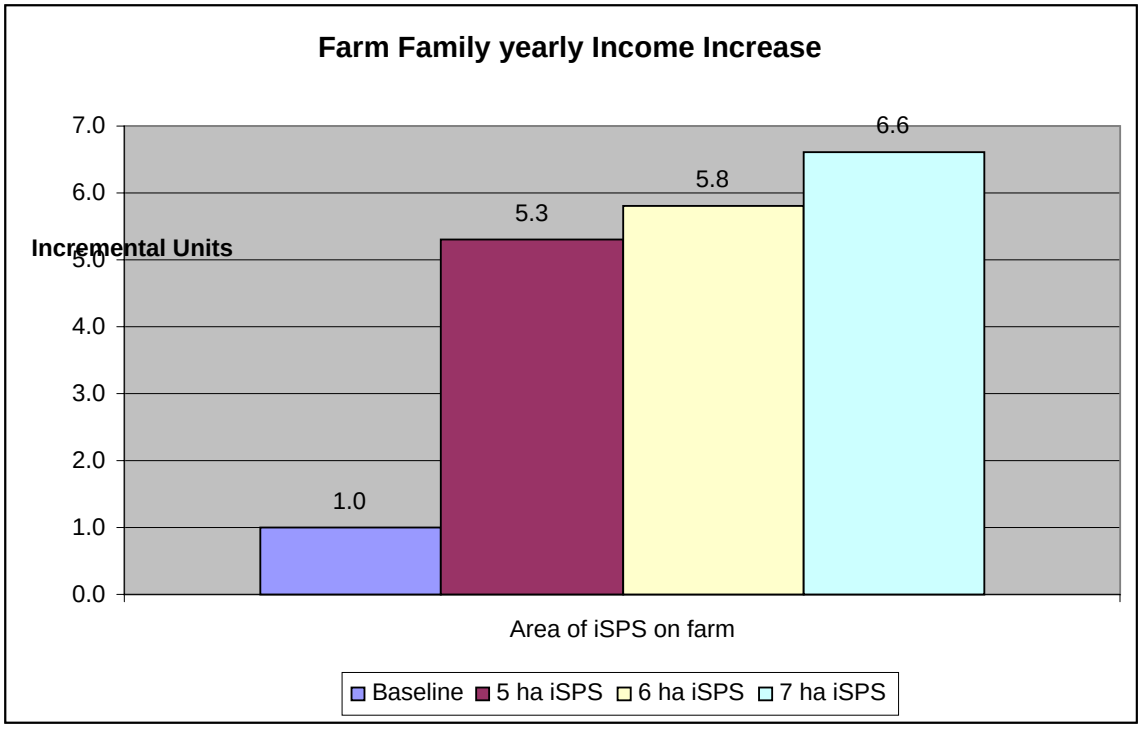
The following graph shows the considerable increase of milk production for farmers adopting intensive silvopastoral production system in 10 hectare farms with 5, 6 and 7

has of iSPS. Applying the iSPS to 6 hectares, a farmer could have a 471% increase in milk production reaching up to 3,175 lt/ha/yr compared to the 675 lt/ha/yr baseline,.



Selling milk is a constant source of cash flow which finances on farm production and sustains the farmers and their families. Capitalizing the family's labor through the increase of the herd represents a large part of a family's long term savings. As the chart below depicts, there is a significant impact on the family economy and their income. Considering a 10 hectare farm the base line net yearly farm income is US$2,271. Adopting 5 hectares of intensive silvopastoral production system this can jump fivefold to approximately US$ 12,000.

These examples demonstrate, under certain circumstances, the economic viability of the silvopastoral system for farmers which bring not only higher returns to their investments but also environmental benefits that can increase the returns from the land. While biodiversity conservation is still difficult to measure, carbon sequestration is easier. Internationally recognized mechanisms are solidifying and access, by farmers, to these markets are becoming easier.



It has been shown (Pagiola et.al. 2008) that not only is there a participation of farmers across the wealth spectrum but in the Matiguás-Río Blanco area of Nicaragua poorer households participated quite extensively and to some extent participated more than better off households. Their participation was not limited to simpler, least expensive options: poorer households tended to implement more substantial changes in land use.

Strategies to induce biodiversity-friendly land management in cattle ranching farms differ according to the profitability of the land use change and the environmental services it provides. While this might seem obvious, the following scenarios, gleaned from field observations demonstrate in a very realistic manner how this is the case:

- Profitable land use changes for cattle ranchers, having positive impacts on biodiversity and carbon sequestration but fewer contributions to environmental services, can be induced with technical assistance and credit (e.g. improved pastures with high density Leucaena or low tree density, fodder banks).
- Land use changes having a moderate short-term impact on farm productivity but offering clear economic returns in the mid to long term, will require short term PES to promote their adoption by compensating for initial investments (e.g. live fences, trees in pastures with diversified commercial value).
- Changes representing an opportunity cost for farmers in the short term, as they imply withdrawing farm land from cattle ranching production for the provision of high value environmental services, will demand mid to long term PES (e.g. watershed protection, secondary forest recovery in degraded pastures). Long-term, non-reversible sources to finance these payments are required.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/Specialty
Lending			
Paola Agostini	Sr. Economist	AFTEN	Task manager
Juan Pablo Ruiz	Sr. Natural Resources Mgmt Spec.	LCSEN	
Mark E. Cackler	Sector Manager	ARD	Sector Mger. Agriculture
Theresa Bradley-Fiscella	Senior Corporate Strategy Officer	CSRSI	M&E - Quality assurance
Jeannette Ramirez	Operations Officer	LCSAR	
Teresa M. Roncal	Operations Analyst	LCSAR	
Cornelis de Haan	Consultant	ARD	Co-TTL & Livestock production
Daniele P. Giovannucci	Consultant	LCSEN	Rural development
Juan Carlos Alvarez	Senior Counsel	LEGLA	
Enzo de Laurentiis	Manager	LCSPT	
Manuel Vargas	Sr. Financial Management Spec.	LCSFM	
C. Izquierdo-Gonzalez	Finance Assistant	LOADM	
Supervision/ICR			
Paola Agostini	Sr. Economist	AFTEN	1st year Task manager
Jeannette Ramirez	Operations Officer	LCSAR	
Teresa M. Roncal	Operations Analyst	LCSAR	
Diana P. Rebolledo	Language Program Assistant	LCSAR	
Juan Pablo Ruiz	Sr. Natural Resources Mgmt Spec.	LCSEN	Task manager
Beatriz Elena Franco	Program Assistant	LCSAR	
John V. Kellenberg	Sector Manager ENV	ECSSD	Sector Leader LCC2C
Natalia Gomez	Rural development Spec.	LCSAR	Acting TTL & rural dev.
George C. Ledec	Lead Ecologist	LCSEN	SSP biodiversity
Stefano P. Pagiola	Sr. Environmental Economist	ENV	Environmental services
Claudia Sobrevila	Sr. Biodiversity Spec.	ENV	SSP biodiversity
Gunars H. Platais	Sr. Environmental Economist	LCSEN	ICR preparation
Cornelis de Haan	Consultant	ARD	Livestock production
Jill M. Blockhus	Consultant	ARD	Livestock production
Alejandra Torres	Consultant	LCSEN	M&E specialist
Monica Rodriguez	Consultant	LCSEN	M & E
German Andrade	Consultant	LCSEN	SSP biodiversity
Marisol Leal	Consultant	LCSEN	Agrotourism
Daniel Uribe	Consultant	LCSEN	Agrotourism
Jorge Kamine	Counsel	LEGLA	
Manuel Vargas	Sr. Financial Management Spec.	LCSFM	

Names	Title	Unit	Responsibility/Specialty
Enrique Antonio Roman	Financial Management Spec.	LCSFM	
Fabienne Mroczka	Financial Management Analyst	LCSFM	
C. Izquierdo-Gonzalez	Finance Assistant	LOADM	
Luis Fernando Rios	Junior Professional Associate	LCSFM	Financial management
Keisgner de J. Alfaro	Sr. Procurement Spec.	LCSPT	
Luis R. Prada	Sr. Procurement Spec.	LCSPT	
Monica Lehnhoff	Procurement Analyst	LCSPT	
Irani G. Escolano		LCSPT	Procurement

(a) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY01	17.85	90.54
FY02	24.03	101.84
Total:	**41.88**	**192.38**
Supervision/ICR		
FY03	7.68	50.64
FY04	14.84	80.45
FY05	7.71	41.89
FY06	8.51	43.62
FY07	15.54	54.63
FY08	20.76	83.84
Total:	**75.04**	**355.07**

Annex 5. Summary of Borrower's ICR and/or Comments on Draft ICR

CATIE (Centro Agronómico Tropical de Investigación y Enseñanza)

Project: Integrated Silvopastoral Approaches to Ecosystem Management

Final Evaluation by the Project Executors and Beneficiaries: Main Lessons Learned

Presented to: The World Bank

September 2008

1. Introduction

This project was negotiated within the LEAD (Livestock Environment and Development Initiative) which is hosted at the FAO headquarters in Rome. One of the objectives of LEAD is to negotiate funding and implement research and development projects related to livestock and environment interactions. CATIE is the focal point for LEAD in Latin America and deforestation-livestock inter phase has been identified as the hot spot for this region. Initially two proposals were submitted by CATIE and CIPAV (one each) to LEAD to evaluate carbon sequestration in pasture and silvopastoral systems (SPS) in Central America and in Colombia. A workshop was organized with participants of LEAD and of CATIE and CIPAV at CATIE´s headquarters to evaluate the proposals submitted and in this workshop it was decided to broaden the focus of the project since cattle ranching was involved not only in emissions of green house gases but also in wide scale deforestation, loss of biodiversity and negative effects on water resources. The experts of CIPAV and CATIE presented research results on the impacts of SPS in improving farm productivity and in the generation of environmental services (ES). However, experiences in Latin America showed that SPS have higher cost for their establishment compared to traditional grass pastures, and the lack of capital was a constraint for adoption of these SPS by farmers. Based on this analysis this regional project was designed with the main objective to determine whether payment for ES generated in silvopastoral and other land use practices was an incentive to tip the balance for adoption of SPS. The focus of PES in productive landscapes and in SPS represented an innovation as PES at the time of project development was concentrated on protected areas and or forest ecosystems.

The project was implemented in Esparza of Costa Rica, Matiguas (Bul Bul and Paiwas) of Nicaragua and in Quindio of Colombia. The areas selected were representative of cattle production systems (dual purpose, beef and milk production) and had different poverty levels such that the poorest farmers were found in the Nicaraguan site. Some of the criteria for selecting the sites were: 1. Degraded pastures and cattle production was a major land use in the pilot areas selected; 2) The sites were not buffer zones of protected areas or national parks to avoid perverse effects of PES in expansion of cattle production in forest reserves; 3) Presences of small and medium size farms; 4) Presence of institutions; and 5) Accessibility and markets for farm products. The baseline study was conducted in 2001 and the project was approved by GEF in May, 2002 and was effective in August 2008. The World Bank and LEAD provided technical expertise to collaborate with local experts in the development and implementation of this project. NITLAPAN which is an NGO within the Central American University was the collaborating institution of Nicaragua. A grant of 4.5 million US dollars was approved by GEF for the project and a sum of US$450,000 was provided by LEAD as co-funding to the project to fund the policy component. Co-funding from farmers and local institutions was also obtained to match GEF-funding.

The project was implemented by CATIE in collaboration with NITLAPAN of Nicaragua, and CIPAV of Colombia and executed by the World Bank. CATIE is a regional center for Research, training and development on sustainable agriculture and management of natural resources in Meso-america and some countries in the South. Nicaragua, Costa Rica and Colombia are member countries of CATIE. The GEF focal points of Nicaragua, Costa Rica and Colombia agreed that CATIE should be the regional coordinator of the project because of its regional experience and of its previous experiences in management of World Bank projects and because of CATIE has been a leading institution in the development of SPS and in management of natural resources in the region. This summary

presents results in each component of the project, and on sustainability of the project and lessons learnt.

2. Project Description

It should be indicated that this was a pilot project with an objective of developing methodological approaches for payment of environmental services in productive landscapes dominated with cattle, and to evaluate how cattle farmers made land use changes with PES. The project had four components:

2.1 Ecosystem enhancement, Extension services and Capacity Building:

- Ecosystem Enhancement: strengthen local development organizations to assist farmers in establishing and maintaining improved SPS
- Capacity building: To assist stakeholders, strengthen local organizations in the technical and institutional aspects of SPS;

2.2 Monitoring and evaluation of Ecological Services. To develop and implement an improved monitoring system to provide accurate information and understanding on the potential of intensified SPS in providing global ecological services and local socio-economic benefits;

2.3 Eco-services payments. To create and implement and eco-services payment mechanism to provide incentives for establishing and maintaining improved SPS on farms. The structure of the payment mechanism is designed to gain experience on beneficiaries response to incentives for land use changes that produce global environmental benefits; and

2.4 Policy formulation and Dissemination. With input from socio-economic assessments, develop replication strategy, including exploration of potential sustainable financing mechanisms, to ensure long-term sustainability of the project.

3. Project Results

3.1 Component 1. Ecosystem enhancement, Extension services and Capacity Building. In the first phase of the project, training and technical assistance was a major activity of the project, as cattle farmers had little knowledge of what is ES and the changes they need to make on their farms to benefit from ES. Training and technical assistance was also provided to local organizations and intuitions which was key for institutional anchoring and scaling-out-up of project results. In the first year of the project a total of 292 farms were contracted for PES. Farms were separated in different groups (PES, PES+ technical assistance, control), however in the last two years some farms dropped out from the project especially because they were sold to private investors. The main out comes of this component are presented below.

3.1.1 Improvement in 12000 has of degraded pastures with practices that were bio-diversity friendly and contributed to improvements in carbon sequestration. A total of 14.2, 20.4, and 2.5 % (total area) of degraded pastures were converted to sustainable practices in Costa Rica, Nicaragua and Colombia respectively. In Colombia there was a larger percentage of grass monoculture pastures were converted to intensive SPS

3.1.2 A total of 3673 has of improved SPS was established in the duration of the project which was 92 % of the target. As mentioned above some farms were sold in the process of project implementation and this was the reason why the target (4000 has) was not achieved. In the three countries the establishment of high density trees in pastures and live fences were the main land use changes on farms, in Colombia intensive SPS was established with Leucaena and multipurpose trees, while in Nicaragua and Costa Rica natural regeneration of trees in pastures were managed as a way to increase tree densities in pastures. The largest percentage increase in the area of fodder banks for dry season feeding was observed in Nicaragua (5%) and this may be associated to cheaper labor prices compared to Nicaragua and Costa Rica. The percentage area of forest (riparian, secondary forest etc) increased by an average of 1%.

3.1.3 The land use changes that farmers made resulted in a net increase of 19,558 tons of C which is 78% of the target (25,000) and reasons for not achieving target are given above. This indicator should have been in CO2 equivalence and not total C and apparently there was an error establishing this indicator. The amount of incremental carbon has an equivalent of 71712 CO2- equivalent (19558 x 44/12) which is the unit used for compensation of carbon on international markets, and this is equivalent to an increment of 1.5 tons/ha/ yr considering an area of 12000 has. The impacts of land use changes on emissions of green house gases are more striking when an analysis is made on impacts on emissions of methane and nitrous oxide. The use of forages of better quality than degraded pastures resulted in a reduction in emission of methane and the incorporation of leguminous trees and herbaceous legumes in pastures is associated in a reduction in the use of N2 fertilizers which results in emissions of relatively large amounts of nitrous oxide (note emissions of N20 from leguminous pastures are insignificant). A case study on some of the farms indicate that those farms which planted Leucaena pastures en Colombia reduced emissions of methane by 21 % and nitrous oxide by 36%, and therefore the overall impact on reduction of green house gases will be greater when these emissions are quantified.

3.1.4 Monitoring of bird species was the main indicator identified for evaluating impacts of SPS on biodiversity in the project, but since biodiversity can be measured at different scales other indicators were measured (for example ants in Colombia, mollusk in Nicaragua, butterflies and small mammals in Costa Rica etc.). The number of bird species in productive SPS (multi-strata live fences and high density trees) was higher than that of traditional grass monoculture and low density pastures and comparable to some forest systems. The number of species registered in the different habitats increased in time and this may be partially explained to the increase in sampling intensity, and that there was more complexity in the structure of the silvopastoral systems with increased growth. Of much importance was that some species of interest for conservation and/or forest dependent species were identified in silvopastoral habitats. At a landscape level 28, 24 and 10 bird species of interest for conservation was observed in Colombia, Nicaragua and Costa Rica respectively.

3.1.5 An index was developed as a tool for payment for biodiversity services using the data bases of biodiversity indicators in the three countries and this index

incorporates variables on tree cover and diversity, area of land use, value or importance of the species etc.

3.1.6 The planting of multi-strata live fences and riparian forest resulted in increased connectivity in the landscapes of the three pilot areas which is key for conservation of biodiversity

3.2 Component 2. Monitoring and evaluation of Ecological Services. Methodology was developed for monitoring of ecological services in the three countries. Below is provided information on the methodologies

3.2.1 As mentioned above an index for evaluation of biodiversity was developed as a tool for PES and validated in different land use practices.

3.2.2 An ecological index was developed for monitoring land use changes using GIS images. The cost for monitoring land use changes with this index was relatively high compared to that used by FONAFIFO of Costa Rica, and the method was simplified to reduce monitoring cost. This index was adapted by the FOCUENCAS project (funded by SIDA) to pay for water services in Honduras.

3.2.3 Monitoring of water resources. In Costa Rica a methodology was developed and validated to quantify the impacts of land use changes on water flows and on quality. In Colombia a method was developed to monitor water quality and validated in different land use systems. The data on water quality showed that the implementation of riparian forest resulted in improvements of water quality indicators (Biological oxygen demand, turbidity, etc). In Colombia and Costa Rica a methodology for participatory community monitoring of water quality was implemented, and many youths are involved in monitoring of water resources including women and/or girls.

3.2.4 Development of method for monitoring of socio-economic indicators. This method was used to evaluate the impacts of land use changes on productivity, income and use of labor on farms.

3.2.5 Training was provided to local experts in the three countries on the use of the methods. 10 MSc and 1 PhD student did their thesis research within the project

3.3 Component 3. Eco-services payments. This component evaluated farmer's reactions to incentive systems for global environmental benefits in terms of land use changes and socio-economic impacts. Farmers who received PES were divided in groups of 2 and 4 year payment scheme; the 2 year scheme received US110/ incremental ecological point and of the four year 75 US$/ incremental ecological point. The objective was to evaluate if farmers with a 2 year PES scheme will continue to manage the system after payment. In Nicaragua NITLAPAN and in Colombia Cipav was responsible to pay the farmers and in Costa Rica a contract was made between CATIE and FONAFIFO for managing PES to farmers. It should be indicated that at the time of implementation of the project there was no national institutions involved in PES to farmers in Nicaragua and Colombia.

An ecological index was developed and it ranked each land use in terms of their value for carbon sequestration and biodiversity conservation, and it was used for PES. In each country 30 farms were monitored to evaluate the impacts on productivity and socio- economic indicators. Additional funding was obtained from the World Bank to evaluate the impacts of PES on poverty. The main outcomes in this component are given below

3.3.1 At the end of the project 265 farms participated in PES which was 91% of the target and reasons are provided above for not reaching the target.

3.3.2 Accumulated PES per farm between 2003 and 2008 was 2500, 2400 and 2300 US$ for Costa Rica, Nicaragua and Colombia respectively. Larger farms received more for PES than small farms, but small and medium size farms had higher amount of PES/ha compared to larger farms in particular in Costa Rica and Colombia. As mentioned above a large percentage of income from PES was generated through land use changes with live fences and high density trees in pastures.

3.3.3 The poverty study in Nicaragua showed that poor and extremely poor farmers made similar changes in land use with PES compared with non-poor farmers, and the results demonstrate that poor farmers can participate in PES schemes. The % area of degraded pastures decreased and the % area of high density trees in pastures and of fodder banks increased in all poverty class.

3.3.4 The study on perception of farmers with respect to the PES scheme of the project indicate that the majority of farmers were satisfied with the amount of money they received for PES but they requested PES on a long term basis. Farmers who had a high baseline of ecological points were dissatisfied that they were not compensated (except for US10/point) in the same way PES was made for incremental ecological points. A large percentage of farmers understood the concept of PES and knew that the money received was for a service provided and not for a subsidy. In the three countries the farmers recommended that technical assistance should be provided for at least 3 to 5 years so as to achieve sustainability.

3.3.5 Farmers were satisfied with the way how institutions managed the payment except in one case in Costa Rica where payments were delayed for at least 4 months because of administrative management within the Public sector which affected FONAFIFO to make payments in time

3.4 Component 4. This component focused on the development of guidelines to promote SPS and establish sustainable benefit sharing mechanisms related to global and local environmental services. Below is provided results on the outcomes of this component.

3.4.1 The baseline study showed that institutions and organizations and farmers had little knowledge of SPS and in the three countries technical support and training was provided to different stakeholders including technicians and farmers which was key for local empowerment in the management of the project. Training and technical assistance was provided to a total of 5097 farmers and 77 institutions and organizations including community group, and these figures surpassed the target of the project by a large percentage.

3.4.2 The barriers for adoption of SPS include high capital cost for investments in SPS and high labor demand for managing intensive SPS in a cut and carry systems

3.4.3 The adoption of SPS in cattle farms resulted in improvements income of farms and in all three countries the targets were reached; in Costa Rica income was increased by 55.5 %, 66.9 % in Nicaragua and 262.3% in Colombia. This improvement was largely due to improved feeding practices with trees and shrubs.

3.4.4 In the three pilot areas the adoption of silvopastoral practices was associated with a significant reduction in soil erosion (45%), and in the use of herbicides for weed control was decreased by 43.2 %. Stocking rates was increased by 38.9%; and in Nicaragua and Costa Rica the frequency of use of fire for managing pastures decreased significantly. These results demonstrate that the project had an impact in the way how farmers managed their farms with the adoption of more sustainable farming practices

3.4.5 Dissemination of results. The results of the project were disseminated to different stakeholders through publications, field days and workshops and seminars. Technical bulletins on topics related to sustainable cattle farming practices (silvopastoral systems, biodiversity, carbon, water management etc) were developed in each country and disseminated to farmers and farmers organizations (FEDEGAN in Colombia, CORFORGA in Costa Rica, and CONAGAN in Nicaragua). The results were also presented to the scientific community by posting information in the LEAD virtual center (Spanish platform managed at CATIE) and through the publication of a special issue of the Agroforestry Journal for the Americas which was edited by CATIE, and a book on sustainable cattle production systems which was edited by CIPAV. Four articles were published in peer reviewed journals to target the international community.

The policy and decision makers were targeted by presenting results of the project in workshops and in policy briefs which was circulated frequently. The project had been very innovative in developing PES in productive landscapes with cattle and because of its success was invited to present results in key events, for example three lunch seminars was organized in the world bank; presentation in parallel workshop organized in COP 7 meeting in Curtiba, Brazil, on mainstreaming biodiversity in agricultural landscapes, and presentation in a workshop organized by GEF in Tunis, on dry lands and desertification. At a national level workshops were organized in all three countries to present the results of the project, and at a regional level the results were presented in a regional workshop for PES organized by CCAD in Central America and in the Wallace conference on payment of environmental services organized by CATIE.

4. Sustainability and replication of project results

One of the challenges of the project was to develop sustainable financing mechanisms for long term sustainability. To achieve this, the project worked on different strategies for

financing including rural tourism, payment for environmental services, credit systems and certification of livestock products. The experiences are presented by each country.

4.1 In Colombia: i) The experiences of the project was used by FEDEGAN (National farmers organization) to develop a program for mainstreaming SPS for sustainable management of cattle production at a national level. The project provided training to experts of FEDEGAN with respect to managing SPS and monitoring and evaluation of ES. FEDEGAN has earmarked funds for credit with the national bank (FINAGRO) and in collaboration with CIPAV, CATIE, TNC and other organizations, is in the process of developing a project for conservation of biodiversity in cattle farms which will be submitted to GEF. The PIF for this proposal was approved by GEF and the proposal is being developed. FINAGRO will provide credit to farmers; 2) In Quindío, the project provided technical support for establishing some cattle farms for rural tourism and over the past years these farms received additional income from rural tourism; 3) The regional cooperation of Quindio used experiences of the project to formulate policies and incentive schemes for the conservation of water resources within key watersheds. In addition, GoC is developing a National PES Strategy where the project has served as an important reference; the scaling-up operation will contribute to the strategy's development.

4.2 In Nicaragua, i) local authorities of the Matiguas- Rio Blanco watershed was supported to develop a system for PES for conservation of water resources in the recharge zones and SNV contributed seed money for financing the payment; ii) NITLAPAN has a technical unit (Tecnoserve) which provides technical assistance to FDL (Local Development Bank) which is a reputable rural finance bank providing agricultural credit at a national level. Recent experiences showed that cattle farmers who accessed credit from FDL were investing in unsustainable farming practices which are associated to pasture land degradation. Based on the lessons learnt in the GEF-silvopastoral project, FDL was supported to develop a green credit package for investing in biodiversity friendly SPS, and this is another way of replication of project results. In 2007, FDL allocated a sum of 400,000 $US to finance credits in the green credit package, and many cattle farmers in the pilot area benefited from this credit, and are investing in the establishment of fodder banks, live fences and high density trees in pastures. FDL plans to increase funding for this credit scheme over the next years and is in the process of negotiating funding from BICE (Central American Bank) in the framework of the Cambio project which is funded by GEF. FDL prepared a proposal to BICE to obtain a credit for promoting biodiversity friendly silvopastoral systems in Nicaragua.

4.3 In Costa Rica, i) The project worked with FONAFIFO to design and implement a regulation for payment of environmental services in agroforestry systems including silvopastoral systems. Under this payment system farmers are paid US1.6 per tree in a three year period and many farmers have been benefiting from this payment system; ii) FONAFIFO developed the Ecomarkets 2 project which will work on watersheds similar to that of the pilot area in Costa Rica, and this project will use the experiences and methods developed by the GEF-silvopastoral project for payment of environmental services; iii) Fonafifo agreed to continue PES to cattle farmers for those land use systems that qualify for PES under its system (e.g. trees in pastures, secondary and plantation **forest).**

5. Main lessons learnt from the project

5.1 PES was a tool to induce the adoption of SPS in particular to those productive practices (high density trees in pastures, live fences etc) which has some ES value. The economic analysis showed that these productive practices were more profitable than current practices after 2 to 4 years of establishment. In order to induce an increase in the area of SPS and forest practices (e.g., secondary and riparian forest) which are of a higher value for biodiversity and carbon sequestration, the incentive schemes may be redesigned to provide short term payments or a green credit package for the productive practices, and long term payments for those practices with higher value for biodiversity and carbon.

5.2 The results on biodiversity showed that there are opportunities for conservation of biodiversity in productive landscapes with SPS and this strategy can be used in combination with other strategies such as protected areas etc., to optimize biodiversity conservation.

5.3 Poor farms benefited with PES schemes and it is possible that these farmers can increase their capacity for investing in land use changes with higher value for biodiversity and carbon if they have access to cheap credit.

5.4 The PES system did not provide full compensation to the baseline ecological points and those farmers who had good silvopastoral practices were dissatisfied and in order to reduce perverse effects of PES, future PES projects should consider compensation of baseline points with conservation value.

5.5 The funds for PES in the three pilot areas was obtained from the GEF grant and part of LEAD funding, and their was some level of success in sustainability of the project for mainstreaming PES in particular in Colombia and Costa Rica. During the implementation of the project, voluntary carbon funds and CDM carbon offsets was only targeting forest ecosystems among others, and therefore it was difficult to negotiate compensation for C in SPS of the project. However, in the recent guidelines published for VCF, compensation will be provided for reduction of emissions of green house gases in livestock systems and this may be a good opportunity for developing PES for carbon. However, cattle production is carried out in watersheds with high value for provision of environmental services, and therefore there are greater possibilities for negotiating PES for SPS in these areas where there is a demand and compensation for PES (e.g private sector for hydro-electricity).

5.6 The project has been very successful in impacting on decisions of policy and decision makers in the Central America region and in the South of America including Colombia and Ecuador.

5.7 The technical support provided by experts of the World Bank was critical for the success of this project.

ADDITIONAL COMMENTS RECEIVED FROM THE CENTRE FOR RESEARCH ON SUSTAINABLE AGRICULTURAL PRODUCTION SYSTEMS – CIPAV, COLOMBIA

Importance to Colombia of the Silvopastoral Approaches to Ecosystem Management Project

Unlike Costa Rica, where a PES scheme was already operating, for Colombia the Silvopastoral project marked an important landmark since it was the first time that an effective payment was made in recognition to the environmental services provided by a productive sector in carbon sequestration and protection of the biodiversity. Although, CDM-type projects were in formulation from long before this initiative, to date no one has made the payments to the suppliers of environmental services. The experience has been essential in the design of the national policy on PES that the government of Colombia is defining since the experience of the Silvopastoral project was considered the most complete and integral of all the analyzed cases. Also it is the first time that PES is used for an activity different to forest conservation proving useful for the conversion of land uses as the FAO recognizes in its last report (2007) on the state of the food and agriculture in the world.

Although all these changes are very important and demonstrate the feasibility of protecting the biodiversity in cattle farms, the most important outcome of the project was the direct persuasion of the cattle union (FEDEGAN) at national level. This, along with other actions, generated the involvement of the Ministries of Agriculture and Rural Development (MADR) and of Environment, Housing and Territorial Development (MAVDT) in the acceptance and support of the implementation of biodiversity-friendly production systems and gave them elements for the generation of policies as mentioned previously.

The project demonstrated that SPS are more profitable than conventional production systems without trees, and provide the opportunity to increase productivity, protect the biodiversity and improve competitiveness (even more with the recent increase in the cost of fertilizers). This applies for small, medium and large-scale cattle farms. The tools generated in the project provided the basis to formulate the strategic plan of the Colombian cattle ranching sector (PEGA 2019) that proposes to reduce the area of pastures in 10 million hectares to reduce land-use conflicts and to release areas for biodiversity conservation. At the same time it aims to increase the national cattle inventory from 23 to 31 million heads via an intensification based on silvopastoral systems, technical assistance and incentives generated thanks to the lessons learned in the project.

In Colombia the most important changes in land use during the project were a reduction of 719 ha (40.2%) in pastures without trees (from 1913 to 1194 ha), and the increase of 761 ha (from 63 to 824 ha) of different silvopastoral systems. In addition there was an increase of 354 km of living fences and of 23 ha of riparian corridors while the area in forests remained unmodified. These changes have remained after the project, which demonstrates that the cattle ranchers fulfilled the agreement without repressive measures under the PES scheme. The changes are highly significant for a very degraded landscape and surpass by far other environmental projects in Colombia which demonstrates the innovative character and the success of the hypotheses proposed.

The SPS held an incremental number of bird species year by year. 28 of the species present in SPS were endangered birds which fulfill one of the attributes demanded by the GEF to protect the biodiversity of global interest. The monitoring of ants in Colombia proved that they are indicators sensible to the changes in tree biomass and showed the same tendency as birds.

The water quality monitoring carried out in Colombia demonstrated that with the implementation of riparian corridors it is possible to obtain a rapid improvement in important parameters such as

BOD (indirect indicator of organic matter pollution), turbidity and the most sensitive aquatic insects groups. Three years after establishing the protective vegetation and avoiding the access of cattle, the main indicators of pollution were reduced to accepted levels. The environmental service related to the reduction of sediments and improvement in water quality give clear guidelines for public policies to protect the riparian vegetation giving opportunity to the small farms to adapt the norms on minimum areas as well as to include the criterion of connectivity through the natural drainages.

Thanks to the Project, several cattle farms started offering agro-ecoturistic services in a pilot experience that will be replicated in other regions where the SPS are implemented.

In the scientific context, the silvopastoral systems have gained a place since they have been included as eligible subject during last calls of projects of MADR and COLCIENCIAS during the last four years. At national level the project also helped creating an interest of diverse institutions on topics such as environmental services and SPS as tools to diminish the environmental and productive conflicts generated by the conventional cattle ranching. Twelve Regional Authorities (CARs) included these subjects in their Triennial Investment Plans.

At academic level the involvement of at least six universities of different regions of the country in the study of diverse productive and environmental aspects of the silvopastoral systems has been very important. In addition, the silvopastoral systems, the environmental services and the incentives to producers are central subjects of the CIEBREG, one of the centers of scientific excellence created by the Colombian Institute for the Development of Science and Technology (COLCIENCIAS) in 2005.

Regarding technological formation, along with Fedegan there has been work so that the SENA, the most important institution of this level in Colombia, includes the subject of SSP and the best management practices of cattle production in its programs including the production of handbooks based on the experience of the project. In addition, FEDEGAN is activating a system of technology transfer through regional Centers that included training of all the technicians so that they give an effective technical help to farmers in the subject of the SSP.

Importance of the Silvopastoral Approaches to Ecosystem Management Project to CIPAV

Thanks to this project, CIPAV gained recognition in the National System of Science and Technology (SNCyT) since it improved its capacity for the investigation and management in the subjects of sustainable cattle ranching, silvopastoral systems and environmental services. The project allowed widespread distribution of a pioneering work that the institution promoted from its beginnings. An unquestionable recognition between the producers was obtained, which is materialized in joint works with FEDEGAN in several fronts and also among scientific, academic and environmental institutions.

Thanks to this experience CIPAV works at present in projects in four out of the five biogeographic regions of the country: the Andean zone, the Atlantic coast, the Orinoco and Amazons piedmont, and in countries of Central America in the development and implementation of silvopastoral systems and PES schemes.

The following is a list of projects and agreements managed in the last years by CIPAV thanks to the experience gained in the project:

- Elaboración de una Estrategia Local que Contribuya a Mejorar la Productividad e Ingresos de Pequeños y Medianos Agricultores Establecidos en la Zona de Amortiguamiento Reserva

Hidrológica Serranía de Darién y el Área Protegida de Canglón, Filo del Tallo y la Laguna de Matusagaratí de la Provincia de Darién. Ministerio de la Presidencia de Panamá;

- Montaje de modelos de ganadería basados en Sistemas Silvopastoriles, en seis subregiones lecheras de Colombia;
- Desarrollo de servicios ambientales en zonas ganaderas de la cuenca del río La Vieja. CVC;
- Diseño e implementación de un modelo de monitoreo técnico y económico para ganadería sostenible. MADR-IICA-FEDEGAN-FNG;
- Mejoramiento de la productividad y calidad de carne mediante modelos de sistemas silvopastoriles intensivos asociados a maderables hacía una ganadería sostenible en la Terraza de Ibagué. MADR;
- Producción de carne bovina ecológica con modelos de Sistemas silvopastoriles intensivos en el norte del departamento de Sucre. MADR;
- Fortalecimiento a las iniciativas de conservación y producción sostenible de la sociedad civil en dos subregiones de influencia y amortiguación de la serranía y PNN Yariguiés. Fondo para la Acción Ambiental;
- Aunar esfuerzos y recursos físicos y económicos para la transferencia de tecnologías y promoción de prácticas sostenibles para minimizar el impacto generado por actividades agropecuarias (caña de azúcar y ganadería en zonas de ladera). CVC;
- Incrementar y mantener sostenible la producción y calidad de la leche en el distrito de Caquetá, sin incrementar el área geográfica y promoviendo usos de la tierra como los sistemas silvopastoriles que favorecen la protección o recuperación de bosques, aguas y suelos. Nestlé Caquetá;
- (Ps) 52224 -Programa Multifase de Desarrollo Sostenible de Chiriquí. Ministerio de la Presidencia de Panamá;
- Reconversión ambiental ganadera con sistemas de uso de la tierra que favorecen la provisión de servicios ambientales en el departamento del Quindío. FASE I. CRQ;
- Reconversión ambiental ganadera con sistemas de uso de la tierra que favorecen la provisión de servicios ambientales en el departamento del Quindío. FASE II. CRQ;
- Incrementar y mantener sostenible la producción y calidad de la leche en los distritos del Cesar, Guajira y Magdalena sin incrementar el área geográfica y promoviendo usos de la tierra como los sistemas silvopastoriles que favorecen la protección o recuperación de bosques, aguas y suelos. Nestlé-PDA.

Annex 6. Beneficiary Survey and/or Stakeholder Workshops

Given the richness of the discussions with different stakeholders held in Colombia, Costa Rica and Nicaragua in January of 2008 they are presented in full following this summary.

To evaluate different stakeholder's perceptions and project impacts, a survey was conducted in the three countries. In the surveys with farmers, more than 90%, in all three countries, indicated that they understood that the payment was for providing an environmental service to the local and global communities. Their perception was that the project was very successful in changing the way they managed their farms from a conventional practice resulting many times in environmental degradation to more sustainable farming practices with silvopastoral systems. Farmers were convinced that the adoption of SPS resulted in improvements in farm productivity and income and in the generation of environmental services. However, they mentioned a preference for long term payments of environmental services. More than 75% of the farmers felt the need for technical assistance, for at least 3 years, to promote the adoption of SPS. They also expressed their willingness to pay for technical assistance. Despite the discontinuity of the payments these farmers indicated that they will continue to maintain the silvopastoral systems.

The perceptions of the policy makers in all three countries were very positive. In Costa Rica, FONAFIFO and the Ministry of the Environment were of the opinion that the project has generated a wealth of information for designing PES systems for agricultural landscapes and indicated that they will use the results of this project for the implementation of the ECOMARKETS II project which has a focus at the landscape level. The Ministry of Agriculture and local policy makers (municipal level in Esparza) mentioned in the results workshop, that they were satisfied with the outcomes of the project. As a successful example they pointed out the support received by the municipality of Esparza to develop an environmental education program which was implemented and is now being supported by the Ministry of Education. Also, the community leaders of Esparza expressed their satisfaction with the project due to the support received for the establishment of the local Watershed Management Committee. For the municipality, this was crucial for guaranteeing water supply and they are currently designing water conservation projects. The private sector, (the large milk cooperative DOS PINOS and CORFORGA of Costa Rica), were impressed with the impacts of the project and requested support to develop incentive systems for replication at a national level in Costa Rica.

In Colombia, it was pointed out that the successful results of the project will be replicated at a broader level with the follow-up project, *Mainstreaming biodiversity in sustainable cattle ranching*. The project has support from the Ministries of Environment and Agriculture, FINAGRO (a second tier bank), FEDEGAN, Fondo para la Acción Ambiental y la Niñez, The Nature Conservancy, CATIE and CIPAV.

Experts at all levels (extension agents to University professors), felt that the project achieved its objectives in changing the way cattle production was carried out. Furthermore it was pointed out that this small project had national level impacts as shown by the interest of many organizations using the results for replication.

In Colombia, thanks to the results of the project, the private sector represented by FEDEGAN has included in its Strategic 2019 Plan the conversion of at least 10 million hectares of pasture to silvopastoral systems. Using project generated information and with the support from FEDEGAN, silvopastoral systems (SPS) are eligible to receive an incentive through the Rural

Capitalization Incentive (ICR). The ICR is a low cost credit line that provides an incentive for the adoption of SSP by assuming 40% of the cost of credit. Additionally, the Ministry of Agriculture and Rural Development assumes 80% of the Technical Assistance cost for SSP.

(a) Stakeholder consultation held in Colombia

PROYECTO REGIONAL GEF/BM ENFOQUES INTEGRADOS SILVOPASTORILES
CONSULTA CON PRODUCTORES E INSTITUCIONES
23 a 31 de enero, 2008

I. INTRODUCCION

- Del 23 al 31 de enero del 2008, durante la misión de supervisión del Banco Mundial que se llevó a cabo en Colombia, Nicaragua y Costa Rica para revisar los resultados del Proyecto GEF/BM Regional, *Enfoques Silvopastoriles Integrados para el Manejo de Ecosistemas*, y recoger insumos para la preparación del informe de cierre del proyecto (ICR por sus siglas en inglés), la misión se reunió con productores beneficiarios e instituciones claves para conocer sus percepciones del proyecto, discutir los resultados del mismo y las posibilidades de réplica en cada país.

PRINCIPALES HALLAZGOS Y CONCLUSIONES

Reunión con Productores e instituciones COLOMBIA, enero 24-25, 2008

El 24 de enero se adelantó la **reunión con productores e instituciones**. En las instalaciones de la Corporación Autónoma Regional del Quindío (CRQ), se reunieron representantes del Banco Mundial y CIPAV con productores del proyecto e instituciones participantes y colaboradoras.

Taller con productores del proyecto

Agenda

Apertura, introducción – Juan Pablo Ruiz y Enrique Murgueitio

Presentación del proyecto y sus resultados – Álvaro Zapata

> Se presentaron los principales resultados del proyecto en el cambio del uso de la tierra, el esquema de pago por servicios ambientales, la metodología de monitoreo, el área de influencia y alcances del proyecto.

Presentación productores – los productores se refirieron a la localización y tamaño de su finca, la categoría en que estuvo en el proyecto (PSA a 2 ó 4 años, con o sin AT; control sin PSA ni AT) y respondieron a la pregunta *¿qué ha cambiado con el proyecto?*

Las principales respuestas sobre el tipo de cambios en las fincas fueron:

- Siembra de árboles en potreros en fincas que no tenían antes nada de árboles
- Establecimiento de cercas vivas
- Siembra de muchos árboles en potreros
- Silvopastoril intensivo con leucaena

- Actividades de agroturismo (experiencias con visitantes incluso extranjeros)
- Protección de bosques nativos y guaduales (*guadua angustifolia*)
- Corredores de conexión entre bosques nativos
- Bebederos sustitutos para que el ganado no entre en los cursos de agua
- Conexión de fuentes de agua
- Incremento de la calidad y el volumen de agua en las microcuencas
- Reducción de la presión en los bosques por consumo de leña gracias a la oferta de cercas vivas con las podas
- Reducción de plaguicidas y otros productos agroquímicos y fármacos para los animales
- Subdivisión de potreros
- Innovaciones tecnológicas en asociaciones de cultivos con árboles y pastos
- Diversificación de café y otros cultivos
- Investigación de árboles forrajeros en zonas donde no funciona la leucaena
- Experiencias de control biológico de plagas
- Reciclaje de residuos

Los productores también destacaron como positivo que en lo personal, familiar y grupal el proyecto les proporcionó:

- Aprendizaje
- Cooperación entre productores, compartir conocimientos frente a una cultura individualista que ayuda a la reducción de los errores.
- Una escuela para el cambio de mentalidad.
- Colaboración con monitoreos (agua, biodiversidad, carbono, socioeconómico).
- Participación en investigaciones.
- Motivación a otras actividades.
- Aprender a hacer planes para reservas de la sociedad civil (privadas).

<u>Comentarios específicos de cada productor sobre los cambios en sus fincas y en lo personal</u>

- Siembra de árboles en potreros en la mayor proporción del área de la finca. Mi señora y mi familia está muy contenta. Ya no uso químico y no pienso volver a utilizar (*Olimpo Montes*)
- Tengo áreas ganaderas reconvertidas con conexión de fragmentos de bosques, dejé además 100 ha protegidas e hice protección de las fuentes de agua (*Constanza Londoño*).
- Siembra árboles en potreros, protección de las fuentes de agua. Cambio potreros sin árboles. Franja de protección de bosques en la zona pendiente. Cercos vivos (*Alba Lucía Madrid*)
- Cercos vivos en toda la finca, potreros arborizados, estoy comenzando a sembrar leucaena. Tengo mucho cuidado con los guaduales. (*John Fernando Gallego*).
- Las zonas pendientes están en regeneración natural. He ensayado con varias alternativas de material vegetal para la zona fría como el botón de oro. Protejo los nacimientos de agua. Hay un cambio de mentalidad en la forma de producir. (*Diego Turriago*)

- La crisis del café me obligó a diversificar con cinco potreros para el ganado. El uso de leña es lo que más deteriora los bosques, ahora con el proyecto y la siembra de cercos vivos me he solventado de leña; ya se han motivado mis vecinos, ellos también siembran, incluso les vendo estacas para que establezcan en sus fincas. Veo más aves que pueden servir como control biológico. No toda la gente tiene mentalidad de conservar los recursos naturales en sus fincas. Estoy convencido del programa. El agroecoturismo es un ingreso adicional para la finca; he tenido experiencia inclusive con extranjeros. A los visitantes están interesados en el día a día de la finca, también les atrae la parte ambiental. (*Alberto Arango*)
- Cuando llegué la finca era un desastre, las pasturas estaban deterioradas. Costos altos por mantenimiento de las cercas con postes muertos de guadua y maderas. He hecho cercos vivos, aislamiento y reforestación de las quebradas. (*Fabiola Vega*)
- Cuando el proyecto comenzó ya tenía cerca vivas. Con el proyecto hice un cerramiento de las fuentes de agua con árboles a un km.; además, nuevas divisiones de potreros con cercos vivos, antes tenía 4 potreros, ahora tengo 28 potreros. También tengo 2 cuadras con leucaena. (*Ever Figueroa*)
- No estoy en el proyecto, hago parte de los testigos. Hemos puesto barreras vivas. (*Felipe Londoño*)
- Tengo 100 ha en el programa. Inicialmente 40 cuadras en yuca (mandioca) con leucaena, fuimos los primeros en hacer esto y nos dio resultados. En la segunda etapa sembramos la yuca con leucaena y árboles, tuvimos algunos problemas pero dieron buen resultado. Los altos costos de los insumos disminuyen la rentabilidad en la ganadería convencional. También hay que tener en cuenta los beneficios ambientales. Rentabilidad y sostenibilidad. No se puede pensar en la ganadería del futuro sin silvopastoriles. Ya el gremio ganadero lo muestra en el plan estratégico de la ganadería 2019. Gracias a CIPAV por su seriedad y credibilidad. Sería bueno poder implementar más área, pero los recursos para hacerlos son escasos. (*Eduardo Marulanda*)
- Yo era el antiguo administrador de la finca la marina que está en el proyecto. En esa época avanzamos con la siembra diversificada de cercas vivas y protección de las fuentes de agua. Ahora en las otras fincas de la familia estoy haciendo lo mismo. En mi finca de 40 ha hectáreas estoy introduciendo árboles en los potreros con la ayuda de CIPAV. (*Jaime Hernán Botero*)
- Tengo 40 hectáreas, estoy en la modalidad de pago a 2 años. Seguí con los cambios sin PSA. He hecho aislamientos de las cañadas (bosque ripario), se triplicó la cantidad de agua. Me gasté mucha plata haciendo el aislamiento de la cañada y el proyecto me dio muy poca plata por esto. La gente de CIPAV mide la cantidad de agua y también la calidad. En los informes que ellos me entregan tengo los datos de la mejoría en la calidad y cantidad de agua. Estoy sembrando leucaena. El monitoreo de la biodiversidad (pájaros, aguas) son valores agregados y nuevas motivaciones. Los trabajadores de la finca van comenzando a cambiar y contribuir con los cambios de la finca. Sobre pregunta de Banco Mundial del agroturismo responde: también es una posibilidad (*Nicolás González*)
- Antes teníamos suelos y pastos degradados. En el proyecto he hecho cercas vivas, reforestación de las fuentes de agua y se nota que el caudal ha aumentado. Hemos

establecido leucaena también. He visto el aumento de la biodiversidad porque cuando quiero semillas de los guamos (*inga sp.*) Ya no se encuentran porque las aves se las comen. No entré en el grupo de asistencia técnica y creo que es indispensable para no cometer errores. Ojalá se repitan estas propuestas para modificar nuevas áreas. (*David Barrios*)

- He participado desde el comienzo del proyecto. En los años 70 teníamos café con sombra, pero en los 90 tuvimos la experiencia de la tumba de árboles porque existió un incentivo de la federación de cafeteros por hectárea para tumbar el café e hicimos carbón con los guamos que teníamos para tener ganadería sin árboles. Las zonas planas sostuvieron su capacidad de carga, pero las zonas pendientes comenzaron su degradación. La falta de conocimiento y de asistencia técnica contribuye a que se cometan muchos errores. La biodiversidad, el guatín (*Dasyprocta punctata*)-mamífero roedor) puede transitar a través de los corredores biológicos. Muy interesante que en CIPAV nos dan los listados de especies de flora y de aves y los productores los pueden tener y ayudar a protegerlos. Este proyecto no sólo debería continuar, sino volverse piloto. Proponer vincular a jóvenes (colegios, universidades, escuelas); programas educativos para mostrar los cambios hechos en nuestras fincas para no sólo mostrar aspectos ambientales, también asuntos productivos donde hay mejoras. Uno de los logros más importantes del proyecto es el intercambio de experiencias prácticas entre nosotros, sobre control de hormigas, siembra de árboles, etc. Los *paisas* somos culturalmente individualistas, pero en este caso compartimos todas nuestras experiencias (*Alfonso López Reina*)

Sesión de Preguntas y Respuestas:
BM: ¿Qué ha significado en términos productivos el cambio para la finca?

Respuestas:

- Duplicar la capacidad de engorde de los novillos. La suma de buena genética y buena comida genera mejor productividad ganadera. Pasé de 300 – 400 gramos de ganancia de peso diaria a 800 – 900 gramos. (*Eduardo Marulanda*)
- No llevo datos, pero tengo un mejor nivel de vida, mejor calidad de vida de mi familia por el mejoramiento de la finca con el silvopastoreo. Cuando tenía café, llevaba bien los datos, me endeudaba para comprar insumos y me quebré. Ahora no llevo insumos a la finca. Ahora desteto a los 8 meses terneros (as) de 200 kg. Sin suplementación (concentrados). Antes destetaba de 230 kg. Pero con suplementación. (*Olimpo Montes*).
- Las zonas que estaban improductivas y pendientes, le sacamos el ganado y se cambiaron para producir cítricos. Las zonas aptas para la ganadería doblaron su carga. Las ganancias de peso pasaron de 300 gramos día^{-1} a 700 gramos día^{-1} (*Alfonso López Reina*).
- El modelo ganadero imperante en la región tiene una alta demanda de insumos. Debemos tener la capacidad de producir la comida en la propia finca. Mejor las vacas que tengo con 13 litros diarios en promedio, y no quiero tener vacas con 40 litros pero que demandan alta cantidad de insumos. (*Diego Turriago*).

- Beneficios en el suelo, aumento de coberturas, aumenta la aireación del suelo. La rentabilidad es el doble, teniendo en cuenta el punto de partida, incluso puede se hasta tres veces, porque cuando utilizamos insumos, tampoco valoramos los gastos en aplicación y transporte. Hasta para las hormigas queda comida y ya no son un problema porque encuentran comida de sobra (*David Barrios*).
- En los cercos muertos gastos permanentes para cambiarlos. Además beneficios intangibles.
- Antes del proyecto tenía 15 reses, ahora 32. Ahorro plata en el mantenimiento de las cercas. Ahora tengo más ganado y cuesta menos sostenerlos. (*Fabiola Vega*).
- Enrique Murgueitio comenta que la finca Asturias recibe incentivo cercano al 10% (113 pesos) más por la calidad de leche (proteína) debido a la mejora en la calidad de la dieta con leucaena.

BM: ¿Por qué se inclinaron hacia ciertas prácticas de silvopastoriles como los cercos vivos, los árboles en potreros y silvopastoriles intensivos?
¿Una vez dado el cambio, el beneficio al finquero se siento o no?

Respuestas (varios)

- Antes tenía que cortar o comprar postes de guadua para cercar toda la finca cada dos años. Al inicio se dudaba que iba a funcionar. Tenía altos costos para cortar la guadua y proteger los árboles pero con los cercos vivos se cambió esta práctica; además se evita el costo de mantenimiento. Encontramos una mejora de pastos con las cercas vivas porque trae nitrógeno, tenemos comida para los animales, protección de las corrientes de aire. (*Fabiola Vega*).
- Con el corte de guadua para usos ganaderos estamos acabando con los recursos naturales. Con cercas vivas tenemos más paisaje, más fauna y no necesitan cambiarse. Contrarrestamos el efecto desecante de los vientos sobre los pastos. Los cercos vivos, dan sombra para el ganado y éste gasta menor energía. Hoy en mi finca ha regresado la fauna, por ejemplo el guatín (*Dasyprocta punctata*) pueda dar toda la vuelta por el predio por guaduales, bosques y silvopastoriles (*Alfonso López Reina*).
- La opción era viable, más fácil de establecer y tenía el incentivo económico que recompensa el trabajo. Conocimos qué era un servicio ambiental que podemos ofrecer globalmente.
- Tuvieron importancia el pago y la asistencia técnica para hacer los cambios. La finca nos está demostrando que si da resultados esta propuesta. (*David Barrios*)
- La asistencia técnica utilizó tecnologías nuestras que no necesita insumos. Aprendimos tecnologías que funciona. La asistencia técnica estuvo de acuerdo con nuestras condiciones, esto puede multiplicarse a toda la gente. En esta zona era lo común que los campesinos salgan y cambie la propiedad de la tierra concentrando el recurso en pocos propietarios. Con esta opción ya no quiero vender la finca. Sabemos que hacemos una labor para el mundo, nos merecemos que sigamos recibiendo el incentivo. Debemos buscar otras fórmulas para pagar a nosotros y a otras personas. (*Olimpo Montes*)
- El incentivo es bajo pero nos sirve mucho.

- Las tecnologías de compra de insumos han hecho migrar a muchos campesinos; esta es diferente porque usa lo que tenemos en las fincas.
- El PSA es diferente a los subsidios que antes recibían (cafeteros); gana el que hace los cambios y hay la certeza de que los están vigilando.
- El cambio costaba más que el incentivo y se hizo.
- No contaba con la plata pero el pago (incentivo) fue un estímulo para lo que hicimos.
- El incentivo (PSA) ayuda porque la reconversión ganadera es costosa.
- Soy del grupo control y no tuve acompañamiento ni pago. Ahora viendo los resultados de los demás, me hubiera gustado mucho haber estado en el proyecto (*Felipe Londoño*).

Atributos que los productores dieron a las cercas vivas (más de 300 km. nuevos establecidos en el proyecto):

- Por que generan múltiples factores: sombra, leña, forraje, reducción de postes muertos.
- Ahorro de tiempo y dinero con los cercos muertos de guadua.
- Ensayaron primero y al resultado positivo siguieron.
- Evita el costo de estar haciendo cercos muertos.
- Mejora la calidad de los pastos.
- Protección del viento (ya los cafetales no protegen porque no tienen arborización).
- Evitar riesgos de accidentes con los trabajadores al extraer los postes muertos.
- Mayor belleza escénica.
- La duración de la cerca (largo plazo).
- Reducción de evaporación de pastos.
- La opción por captura de co_2 era viable (por el PSA): el espacio físico para hacerlo.

BM: ¿qué harían y qué no harían del proyecto? (recomendaciones)
¿Ahora que finalizó el proyecto, volverán a las prácticas anteriores?

Respuestas (varios):

- Ahora los productores somos multiplicadores de estas prácticas.
- No creemos que nos devolvamos a las prácticas anteriores porque estamos motivados y convencidos.
- Estamos dispuestos a hacer lo que hicimos y mucho más. Ya hay un cambio de mentalidad.
- Cuando se cayó el precio del dólar, el proyecto reajustó el pago y esto da seriedad del proyecto; es bueno tenerlo en cuenta en otros proyectos.
- Soy del grupo de 2 años, los mayores cambios los hice la final del proyecto. Al inicio del proyecto tuvimos errores y con el tiempo fuimos desarrollando confianza y los cambios los hicimos.
- Se deben incentivar estas tecnologías propias no otros modos de producción foráneos (*Olimpo Montes*).

- Se debe construir un incentivo que puedan recibir los productores de leche o carne por prácticas sostenibles.
- Ya tenemos una línea base alta, como hemos aumentado los puntos y si siguiéramos en una segunda fase no recibiríamos estos incentivos. Sería interesante poder tener un incentivo por lo que conservamos. (*Olimpo Montes*).
- Me hubiera gustado haber pertenecido al grupo con la asistencia técnica. He recibido donaciones de árboles e incentivo para sembrarlos, pero no son suficientes. La asistencia técnica sirve para no equivocarnos. El acompañamiento es otro incentivo (*David Barrios*).

BM: ¿cuáles son las lecciones aprendidas y qué limitaciones identifica?

Respuestas (varios):

- Logramos un cambio de mentalidad.
- Valoré mejor mi finca.
- Aprovechar lo que tenemos, valorar lo que nos da la naturaleza.
- Mejoraron nuestras tierras.
- Podemos dejar los químicos a un lado.
- La sostenibilidad no sólo es económica.
- Una limitación es la consecución de material vegetal de buena calidad.
- Debemos multiplicar estas prácticas en todo el país.
- Nos ayudó a tener una visión de largo plazo.
- La unidad que se ha logrado entre los productores.
- Hay que dar continuidad al proyecto pues apoya la ganadería, la cual sostiene las otras actividades.
- Debería haber otra salida al finalizar el proyecto, buscar nuevas alianzas. No desarticularnos de esta manera.

BM: ¿qué pueden decir sobre el pago por servicios ambientales (PSA), es mejor a 2 ó 4 años?

Respuestas (varios):

- Es mejor en 4 años; en 2 años apenas comienza a entender la propuesta.
- Al principio uno no está seguro y cuando decide hacer los cambios ya perdió la posibilidad de recibir el incentivo.
- Mejor 4 años porque con el tiempo se van desarrollando las capacidades.
- En el último año planté más árboles que los que había plantado durante los últimos 4 años.

Reunión instituciones y organizaciones

<u>Agenda</u>

- Apertura, introducción (Juan Pablo Ruiz, Enrique Murgueitio)
- Presentación resultados (Álvaro Zapata, David Fajardo)
- Presentación de los asistentes

- Discusión
- Lecciones aprendidas y propuestas de continuidad

A continuación se presenta el resumen de las intervenciones de los participantes a la reunión:

- El proyecto llegó en un momento oportuno por la tendencia regional al cambio de uso de la tierra de café a potreros sin árboles. Debido a esta transformación comenzaron graves problemas de compactación y erosión, que fueron evidenciados por un estudio hecho por CIPAV y CRQ años antes de iniciarse el proyecto. Como resultado del proyecto hemos incorporado metas de reconversión ganadera en el Plan De Acción Trienal, PAT; además, en el Plan De Gestión Ambiental Regional, PGAR, que es a 12 años hemos incluido las mismas iniciativas (*Julio César Orozco – CRQ*)
- En biodiversidad, una de las tres especies de avifauna amenazadas reportada por el proyecto (*Ammodramus savanarum*), no tenía reportes desde 1974. La CRQ quiere trabajar con esta especie. También veo como un cambio positivo que una finca del proyecto que visité esta semana, liberó algunas áreas con altas pendientes para la conservación. Se ha avanzado en algunos municipios con incentivos a la conservación. El proyecto debe mostrar la rentabilidad de los sistemas introducidos para que estas prácticas sigan y no se regresen al estado inicial. (*Diego Duque – CRQ*)
- Utilizamos la reglamentación del uso del suelo, trabajo hecho en conjunto CIPAV y CRQ, en nuestro trabajo con ganadería. En el PAT se incorporó la reconversión ambiental ganadera en el programa de prácticas sostenibles. Nos preocupa que pasará con la gente que deje de recibir el incentivo. (*José Guillermo López – CVC*)
- Es muy importante que hubo un cambio de tendencia del modelo rotacional intensivo con altas cargas de fertilizantes hacia prácticas sostenibles. En el comité de ganaderos del Quindío no estuvimos de acuerdo con la reglamentación obligatoria del uso del suelo porque necesitamos "menos garrote y más zanahoria" y el proyecto es un ejemplo de que si es posible y los productores responden. Así el Quindío se convirtió en ejemplo a nivel nacional en la promoción de sistemas sostenibles de producción ganadera. Tenemos visitas de grupos de todo el país. El proyecto dejó huella en la región y fue definitivo el acompañamiento y la asistencia técnica. Estamos muy agradecidos y en particular con CIPAV (*Juan E. Toro – Presidente Comité de Ganaderos del Quindío*).
- Es difícil conseguir el material vegetal para sembrar en las fincas porque no hay mucha disponibilidad en calidad y las especies recomendadas; hay demasiadas pérdidas de árboles sin la misma. El ensayo y error deja muchas pérdidas (*Juan E. Toro – Presidente Comité de Ganaderos del Quindío*).
- Los predios del proyecto sirven como fincas demostrativas en la región. Ahora hay una visión diferente de los productores (cercos vivos, disminución usos de insumos) que contribuyen la biodiversidad. Importante que no son sólo los productores, ya los gremios y las corporaciones autónomas incluyen en sus planes trienales esta temática (*Luís Mario Millán - CVC*).

- Primero hay una etapa de convencimiento del productor que es muy importante. Las corporaciones autónomas tienen una motivación netamente ambiental; sin embargo, a los productores se les convence con hechos económicos y ya comienzan a importarles los temas ambientales. Veo con satisfacción que ahora un productor que se negó a hacer el proyecto piloto de CRQ-CIPAV, hoy en día es el primero que cubrió el 100% de silvopastoril sin pago ni asistencia técnica. Se logró demostrar que no hay conflicto entre la producción y la conservación (*Juan Manuel Rivera – Corpocaldas*).
- Destaco que tecnologías sencillas como las propuestas por el proyecto, pueden contribuir a la transformación de los paisajes. El proyecto logró promover y hacer cambios que había sido para los organismos del estado que están en la zona muy difícil de completar con los mecanismos actuales. (*Albeiro Montoya – Corvisa*)
- Los beneficios regionales pasaron a ser beneficios nacionales. Recibimos giras ganaderas de fedegan provenientes de todo el país. (*Ricardo Botero – Fedegan, Tecnig@n Pereira*).

Sesión de Preguntas y Respuestas:

BM: ¿Cómo puede seguir esta dinámica del proyecto sin los incentivos?

Respuestas (varios):

- La sostenibilidad está dada por la capacitación de grupos, instituciones, técnicos, estudiantes. Nos pareció muy importante lo que hizo el proyecto en la capacitación de niños en la valoración de la calidad del agua, monitoreo de quebradas y prácticas con macro invertebrados; se debería capacitar más niños en estos temas del agua. Se deben sistematizar las experiencias (libros, documentos), porque contribuyen a la formación de las personas de la zona que no tuvieron contacto directo con el proyecto y en esto CIPAV es un ejemplo de cómo hacerlo. Lo que recomiendo es tener más acercamiento a las instituciones educativas (universidades, sena) para que los nuevos profesionales y técnicos se apropien de los silvopastoriles a futuro. (*Martha Yolanda Montoya – Sena Orquídea*).
- Los planes de ordenamiento territorial de los municipios deben estar ligados a procesos de incentivos económicos: debe haber una política pública para la difusión de sistemas silvopastoriles ligada al ordenamiento de los territorios ahora que en la zona cafetera contamos con apoyo de las corporaciones autónomas, comités ganaderos, ministerios de agricultura y ambiente; gremios, autoridades municipales. Se debe motivar a los ganaderos para el establecimiento de prácticas sostenibles y en contexto del paisaje se puede mejorar la conectividad con las prácticas silvopastoriles. (*Daniel Uribe – Agroecotur*).
- Se debe incidir más en política pública con estas iniciativas; por ejemplo cinco de los doce municipios del departamento del Quindío estimulan la conservación ambiental con reducción del impuesto predial, pero aún no reconocen la reconversión ganadera. Deben haber sinergias entre los sistemas regionales y departamentales de áreas protegidas, SIRAP y SIDAP, respectivamente. (*Jorge Hernán López – Red de Reservas Naturales de la Sociedad Civil, Resnatur*).

- En la gestión ambiental de países en desarrollo existe una gran incertidumbre por los cambios permanentes en las administraciones como las corporaciones autónomas (autoridades ambientales en colombia). En este caso de la ganadería se ha demostrado que es un proceso de largo plazo y las propuestas deben permitir mejorar la calidad del ganado, pero de la mano del cuidado del suelo por lo que debe haber convivencia entre conservación y producción. Nosotros ofrecemos continuidad y una mirada a largo plazo a estos procesos, por eso les decimos que la CRQ participó antes y durante el proyecto y continuará haciéndolo así por ejemplo ya estamos trabajando con CIPAV en la zona alta del río Quindío donde las áreas de conservación de bosques reguladores de agua deben ir explorando las posibilidad de coexistir con la silvicultura ganadera: invitamos al banco mundial a acompañarnos en otros proyectos, estamos listos y ofrecemos las contrapartidas como en este proyecto (*Carlos Alberto Franco - Director CRQ*).
- Son complementarios los proyectos GEF Andes y GEF Silvopastoril en la incidencia en temas de conservación. En muchas ocasiones, la única posibilidad de conservación se da en agroecosistemas degradados. Es un trabajo importante y admirable que debe continuar (*William Vargas – Instituto Humboldt*).

BM: Los productores dicen que no regresarán a sus prácticas anteriores ¿cómo están considerando dar seguimiento?

Respuestas (varios):

- Durante el año pasado se adelantó el proceso con la ecorregión del Eje Cafetero, en donde cinco corporaciones autónomas (CVC, CRQ, Corpocaldas, Carder y Cortolima) acordaron que serían incluidos temas de reconversión ganadera en los PAT. Es una prueba del compromiso institucional con el tema. (*Julio César Orozco, CRQ*).
- Debe hacerse difusión de las experiencias que permiten acercar más personas y organizaciones, pero debería haber más capacitación de las instituciones, técnicos, tecnólogos. Es necesario hacer un esfuerzo colectivo en capacitación para el uso de sistemas sostenibles incluyendo la ganadería. (*Marta Yolanda Montoya – Sena*).
- Se debe mostrar la rentabilidad de los sistemas a los productores para lograr la multiplicación en este tipo de estrategias. (*José Oscar Osorio – Corporación Futuro Sostenible*).
- Lo que se hizo en la cuenca del río la vieja, contribuyó para generar propuestas ganaderas sostenibles en todo el país y el proceso seguirá en otros municipios. (*José Guillermo López – CVC*).
- Se debe conocer más a fondo cada uno de los renglones que intervienen en la producción ganadera y agrícola y poder proponer cosas más acordes con la realidad de cada uno de ellos en cuento a la reglamentación. Debería involucrarse más a la universidad para formar no sólo técnicos sino también estudiantes. (*Julio César Orozco – CRQ*).

BM: ¿tiene algunas propuestas de continuidad con los productores del proyecto?

Respuestas (varios):

- Con Agroecotur se han identificado dos mercados especializados: el turismo científico (avifauna, flora, ganadería) y el turismo educativo (colegios, universidades) en varias fincas del proyecto. Por ejemplo ahora tenemos una solicitud de un colegio de Cali que quiere hacer una salida con los estudiantes para que conozcan las diferencias de agro climáticas en diferentes pisos altitudinales. Promovemos el turismo como modelo de ingreso adicional, que no cambie la vocación productiva de las fincas que son oferentes de la propuesta. (*Daniel Uribe – Agroecotur*).
- Se debería hacer una presentación de los resultados de los proyectos a los estudiantes del sena. Este proyecto se fue pero debemos apostar a otros proyectos. Más acercamiento a las instituciones educativas con más agresividad para la formación de los técnicos; garantía de multiplicadores como universidades y sena; esta última tiene ya tiene una política ambiental y un plan de manejo ambiental para cada regional (biodiversidad, agua): capacitación de técnicos de sistemas agroforestales y buenas prácticas agropecuarias (*Marta Yolanda Montoya – Sena*). Se buscará continuar la certificación ecológica de los productores ganaderos. Ya existe un grupo de 19 finqueros que hacen parte del "grupo ganadería ecológica del eje cafetero". Se empezó a recibir bonificaciones en el precio de la leche por proteína en algunos productores del proyecto que tienen más arbustos forrajeros. Se está buscando un sello silvopastoril ecoamigable que sería más interesante que las normas orgánicas. (*Enrique Murgueitio – CIPAV*).
- Mayor acompañamiento de técnicos a los productores en el tema forestal (*Juan Enrique Toro, Comité de Ganaderos del Quindío*).

Finalmente varios participantes reconocieron y felicitaron al Banco Mundial por su dirección, seriedad y calidad técnica, incluidas las misiones de acompañamiento

(b) Stakeholder consultation held in Costa Rica

Reunión con Productores e instituciones COSTA RICA, enero 26 – 28, 2008

Reunión con productores del proyecto en Costa Rica

Con el propósito de conocer la percepción que tienen los productores del proyecto sobre su participación y los principales resultados del proyecto, se realizaron encuentros con grupos de productores, dos visitas a finqueros y una reunión con la Asociación Procuenca del Río Jabonal.

Se visitó la finca de la Sra. Mabel Ledesma y se realizó un recorrido para ver los principales cambios de uso adelantados, los bancos forrajeros, una idea de corredor biológico, así como la implementación de tecnologías como el biodigestor (con el cual cocinan), el compostaje y el lombricompost. Así mismo se visitó la finca del Sr. Jorge Morera, quien tiene un sistema de engorde con SSP (principalmente árboles en potreros y bancos forrajeros) y ahora desarrolla una propuesta de turismo rural en su finca (brinda alojamiento en casa con piscina, senderos ecológicos, conservación de agua, mariposario, etc.). Ambas visitas contaron con la participación de grupos de productores (en promedio

15 productores por grupo) con los cuales se realizaron conversatorios para recoger sus principales impresiones del proyecto.

La mayoría opinó que los SSP constituyen una herramienta útil para la obtención de alimento en la época de verano; simpatizan mucho con los árboles en potrero y los bancos forrajero; valoran que hayan tenido el PSA que les permitió hacer cambios de uso del suelo en sus fincas y aumentar las productividad de su fincas, también porque ha generado más conciencia sobre los temas de conservación del ambiente, disminuido el uso de herbicidas; ya no queman el suelo. Consideran que su grado de educación es más alto por influencia del proyecto; reconocen que involucrar a la familia como estrategia de comunicación colectiva es un logro del proyecto, y reconocen el papel del acompañamiento técnico por parte del proyecto. No tienen mucho contacto con el servicio de extensión del MAG a pesar de que se realizaron muchas actividades conjuntamente y se capacitaron los técnicos. Los productores en general manifestaron su complacencia con el proyecto y solicitaron se ejecute una fase posterior que le permita a otros productores ser beneficiarios de la tecnología y que se considere un periodo de pago más largo.

También se visitó la finca del Sr. Nelson Benavides, quien definió que el principal aporte que ha tenido del proyecto aparte del pago (el cual ha invertido en la finca) es la capacitación y la enseñanza que ha recibido. Trabaja un sistema de engorde (compra-venta) con bancos forrajeros como una estrategia de suplementación en la época de verano. Ha reducido costos de producción hasta en un 50%, ha disminuido considerablemente el uso de herbicidas y las quemas, y ha incrementado la ganancia de peso hasta ½ kilo por día entre otros beneficios, además regala semilla de leucaena en la zona para impulsar la siembra de bancos forrajeros.

Finalmente se tuvo una reunión con la junta directiva de la Asociación Procuenca del Río Jabonal, cuyos miembros mencionaron que esta asociación (ahora con personería jurídica) fue creada en el marco del proyecto, y tiene por objetivo velar por el desarrollo y manejo ambiental de la cuenca. Con la finalización del proyecto, la asociación está trabajando con la Universidad de Costa Rica, implementado un plan de manejo para los próximos 5 años bajo una estrategia de siembra de SSP para proteger las fuentes de agua de las fincas ganaderas de la zona. Así mismo está intentando replicar algunas tecnologías de manejo de residuos mediante la implementación de biodigestores que puedan ser financiados por el PNUD, con manejo de los recursos por parte de la misma asociación.

Reuniones con instituciones

1. **FONAFIFO, Jorge Mario Rodríguez, Director, y Hernán Hernández, responsable PSA –** el Director de FONAFIFO manifestó que el proyecto GEF Silvopastoril ha generado resultados valiosos sobre la biodiversidad en paisajes ganaderos y el pago de servicios ambientales en fincas ganaderas. Anotó que el proyecto ha apoyado a la institución en el desarrollo de un esquema de PSA para sistemas agroforestales con base en número de árboles plantados, ya que FONAFIFO

utiliza otra metodología diferente para PSA. En este momento los expertos de FONAFIFO y del proyecto silvopastoril están trabajando en una modificación de la metodología de PSA utilizada tradicionalmente por FONAFIFO con base en las lecciones aprendidas por el proyecto Silvopastoril. Además el Director indica que los resultados del proyecto silvopastoril se pueden replicar en un alto porcentaje de las áreas agrícolas en Costa Rica donde la ganadería es predominante, y por lo tanto la institución está dispuesta a apoyar la iniciativa de elaborar una propuesta para GEF que sirva para la replicación de los resultados del proyecto. Adicionalmente existe un compromiso de FONAFIFO de continuar con el pago de servicios ambientales generados por los SSP una vez el proyecto termine.

2. **Fundecooperación**, Sr. Enrique Meza, **Director de Crédito** – Fundecooperación es una ONG que enfoca su trabajo en diferentes temas del desarrollo sostenible, entre ellos actividades de agropecuarias sostenibles, en el año 2006 crearon un programa de crédito diferenciado (bajas tasas y excelentes garantías de pago) dirigido a pequeños y mediano productores del país, recursos que ofrece a una tasa diferencial del mercado y con el fin que los productores pueden incluir en sus fincas sistemas más a amigables de producción como es el caso de los SSP. Actualmente está conformando una pequeña cartera de crédito con un millón de dólares para ganaderos que no tiene garantías prendarías, ya ha otorgado créditos a ganaderos del Atlántico (Siquirres) que están incluyendo en sus fincas estos sistemas. Así mismo mencionó que Fundecooperación está dispuesta a hacer parte de una futura propuesta, para lo cual pondría recursos de crédito disponibles para que los productores puedan realizar sus inversiones en las fincas, recibiendo a cambio inclusive su hato o producción con prenda de garantía sobre la deuda. De otra parte, Fundecooperación tiene un programa de turismo sostenible dirigido a zona rurales, por lo que también eventualmente podría apoyar productores ganaderos que deseen empezar actividades de turismo en sus fincas.
3. **CORFOGA, Erick Quiroz, Director –** Explicó que la corporación ganadera cuenta con más de 600 socios y un programa de crédito rotatorio (fondo rotativo) (hasta US$ 22,000 por productor) manejado por un banco estatal. Tiene las tasas más bajas del mercado para productores ganaderos de carne – ofrecen hasta un 50% de prenda sobre el hato o sobre hipoteca, garantía prendaría sobre el aumento de la productividad de sus animales y periodo de gracia hasta de tres años. El director de CORFOGA reconoció el papel del proyecto Silvopastoril en la generación de resultados y estrategias de producción diferenciadas para los productores, muchos de los cuales ya están adoptando la tecnología silvopastoril con el propósito de tener mayor productividad en sus fincas. Ofreció recursos de capacitación para replicar los resultados en diferentes zonas del territorio nacional, también para el montaje de fincas demostrativas en conjunto en el territorio nacional. Además continuarán publicando los resultados del proyecto Silvopastoril en su boletín bimensual, el cual está dirigido a más de 8,000 personas, incluyendo ganaderos, subastas ganaderas y el público en general. Por último, indicó que estarían interesados en participar activamente en otra fase del proyecto, poniendo recurso del crédito rotatorio para los productores ganaderos que la Corporación podría estar recuperando con el mismo pago por los servicios generados.

4. **Cámara de Leche, PROLECHE, Erick Montero**, **Director –** es una organización voluntaria con más de 800 productores socios; está satisfecho con los logros del proyecto y propone continuar con la investigación para generar más sostenibilidad económica de la actividad. Para esto propone el montaje de fincas demostrativas al menos en 4 regiones del país y así mismo validar y entregar resultados por grupos (carne y leche) en esas zonas (altas y bajas) para realizar comparaciones. Además le interesa trabajar en zonas altas lecheras para generarle a los productores lecheros una alternativa viable para que mejoren su sistema de producción con base en los SSP. Propone realizar alianzas con el Ministerio de Agricultura y las ASAS (oficinas locales de extensión del ministerio de agricultura en cada región). Finalmente menciona que está interesado en continuar trabajando en la estrategia de divulgación de resultados y por último recomienda que para un nuevo proyecto se pueden tomar en cuenta otras zonas altitudinales, validarlo en otras zonas de vida e implementar más bancos forrajeros
5. **Rainforest Alliance, Oliver Bach, Gerente de normas y políticas de agricultura sostenible-** se inició un trabajo conjunto para diseñar una norma de certificación de fincas con buenas prácticas ganaderas que facilite la entrada de productos amigables con el medio ambiente, el comercio justo, etc., a diferentes mercados nicho de productos certificados sosteniblemente. Informó que en noviembre 2007, el proyecto presentó la propuesta al comité internacional de normas del Rainforest Alliance y la misma fue aceptada, por lo que el plan es que el equipo del proyecto continué enriqueciendo el borrador inicial, para empezar el proceso de consultas publicas a partir de junio del 2008, posterior a la aprobación del documento por parte del comité. Además comentó que ya se tiene conformado un grupo de trabajo interinstitucional que dará seguimiento al trabajo, así mismo que disponen de recursos para la realización de un estudio de mercado que se estará realizando durante el primer semestre del año. Respecto a un nuevo proyecto, RA estaría participando, promoviendo el sistema de certificación que se diseñó conjuntamente con base en el sistema de producción con SSP y gracias al cual los productores podrán tener beneficios adicionales no sólo en lo ambiental, sino también más ingresos por la venta de sus productos diferenciados.
6. Por último, cabe mencionar que previo al inicio de la misión se contactó al Sr. Rubén Muñoz, punto focal del GEF en Costa Rica y funcionario del MINAE, y se le invitó a formar parte de las reuniones. Pocos días después de la llegada, se nos informó que por funciones inherentes a su cargo, el Sr. Muñoz no podría participar, pero hacía expreso su interés en colaborar con fondos del RAF de biodiversidad para una nueva fase del proyecto GEF Silvopastoril. En visita anterior, el Sr. Juan Pablo Ruiz y el coordinador regional del proyecto se habían reunido con él y en ese momento expresó el mismo interés.

(c) Stakeholder consultation held in Nicaragua

Reunión con Productores e instituciones NICARAGUA, enero 29 – 31, 2008

Reunión con productores del proyecto en Nicaragua

Con el fin de conocer directamente la opinión de los productores sobre su participación en el proyecto, la misión visitó la comunidad de San Ignacio atendida por el proyecto. Se conversó con 10 productores que expresaron su aceptación y disposición a continuar manteniendo en sus fincas los SSP una vez que el proyecto finalice. También expresaron lo importante que fue el pago por servicios ambientales para poder realizar inversiones en las fincas. En los 4 años del proyecto, la mayoría logró duplicar la carga animal, incrementar la productividad y realizar mejoras en sus fincas. Entre los factores negativos del proyecto que los productores mencionaron está el de la existencia de 3 grupos de trabajo y dos esquemas de pago. Ellos prefieren que para proyectos futuros solamente exista el de PSA + Asistencia Técnica y en un tiempo de 4 años.

También se hizo un recorrido por la finca del productor Erasmo González en donde se pudieron verificar los cambios realizados, destacándose el establecimiento de pasturas mejoradas con árboles, bancos forrajeros de gramíneas y leñosas, cercas vivas y protección de fuentes de agua, entre otros. También se visitó la finca del productor Esteban Flores que la misión recorrió, constatando los cambios realizados. En esta finca se observó el potencial e interés del productor para implementar a futuro un modelo agroturístico.

Reuniones con instituciones

1. **MARENA, Lic. Roberto Araquistain**, **Viceministro** – se le expresó la voluntad por parte del Banco Mundial de elaborar un proyecto que significaría una segunda fase del proyecto Silvopastoril en Nicaragua, para lo que se requería una carta de no objeción del punto focal del GEF en Nicaragua y contar con algunos de los fondos del RAF de biodiversidad del país. El viceministro afirmó que actualmente existen otros proyectos GEF, pero que estarían anuentes a priorizar esta iniciativa. Sugirió que la ubicación del proyecto coincida con los municipios que se atienden con el proyecto corazón – el cual es un proyecto GEF – y de donde se podrían obtener recursos para su financiación. Se acordó que en los próximos días se le estaría enviando el PIF para su revisión y que posteriormente expediría la carta de no objeción.
2. **Escuelas de agronegocios Nitlapan, René Gómez, Coordinador –** Se expuso lo que es Nitlapan y los últimos cambios relacionados con la nueva planificación estratégica. También se abordó cómo las lecciones y tecnologías silvopastoriles implementadas por el proyecto GEF han sido incorporadas en los temas de capacitación a los productores que Nitlapan atiende (aproximadamente unos 2,000 a nivel nacional) y la relación existente con el Fondo de Desarrollo Local, FDL, al que se ha apoyado en el diseño de un producto financiero llamado Paquete Verde.
3. **Fondo de Desarrollo Local, Elizabeth Campos, Subdirectora –** se explicó que es el FDL, su dimensión, su cartera y clientes, en donde se observo que es una de las micro financieras mas importantes y sólidas en el país, se realizo una exposición sobre lo que es el Paquete Verde, sus políticas, a quien esta dirigido y sobre la

importancia del mismo en el fomento de inversiones en fincas orientadas al fomento de tecnologías amigables con el medio ambiente.

4. **Carlos Barrios, Consultor para la cooperación externa** – se discutieron sus percepciones del proyecto GEF silvopastoril. Según el sr. Barrios el proyecto ha tenido mucho éxito en inducir cambios en la actitud de los productores, ahora ellos están más capacitados y tienen mayor conocimiento para planificar y manejar sus fincas utilizando las tecnologías de SSP. En este momento hay un buena demanda para leche (e.g. Venezuela va comprar grandes cantidades) y carne pero la falta de infraestructura y organización de los productores es una limitante para que los productores puedan comercializar la leche y carne producida en la finca. Indicó que un proyecto de réplica debe tener un enfoque territorial que incluya el desarrollo de infraestructura y centros de acopio, utilizando el enfoque de cadenas de valor para que los productores puedan tener valor agregado para sus productos. Esto se debe complementar con incentivos para la adopción de buenas prácticas, sistemas silvopastoriles y con asistencia técnica a los productores. Informó que es posible que el gobierno nicaragüense gestione un crédito del Banco Mundial para el desarrollo de infraestructura ganadera, lo que contribuiría al trabajo de las instituciones con el sector ganadero. Además ratificó que el FDL está comprometido en apoyar la adopción de los SSP en una eventual propuesta a ejecutar con fondos de biodiversidad del RAF.
5. **MAGFOR, Arkángel Abaunza, Director de políticas tecnológicas –** las autoridades del MAGFOR manifestaron que el Proyecto Silvopastoril fue muy exitoso, en vista de que promovió la adopción de sistemas silvopastoriles que resultaron en mejoras de la producción de la finca y a su vez en la generación de servicios ambientales. El MAGFOR ha identificado la implementación de los sistemas silvopastoriles en su programa a nivel nacional y su objetivo es fomentar prácticas que resulten en la seguridad alimentaria y en la conservación del ambiente. Se han identificado los ejes del desarrollo sostenible de la ganadería en la zona central, sur y el occidente del país. Manifestó un interés en replicar el proyecto silvopastoril, utilizando un enfoque territorial para el desarrollo de la ganadería con vínculo a mercados y diversificación de la producción a partir de los recursos forestales. Se ha discutido la posibilidad de que MAGFOR gestione un crédito del Banco Mundial bajo la ventana de fondos IDA que ofrece una tasa de interés diferencial para Nicaragua. Se acordó que discutirían este asunto internamente con las instancias del Gobierno y comunicarían los resultados a la misión de BM. Si se gestionara el crédito del BM, es posible que el crédito lo maneje el MAGFOR, así se podría incentivar y fomentar la adopción de las buenas prácticas en fincas ganaderas, apoyar la instalación de infraestructura, centros de acopio y mejoras en vías para fomentar la mayor recolección de leche.

Annex 7. List of Project Generated Documents

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Annex 9. Biodiversity and Environmental Service Index

The following formula was used to calculate an index for biodiversity services payment

$$IBSP = \sum_{i=1}^{i=n} \left[VI_i * Ab_i / abT \right] * \left(S_{ha} \right) + \left(Va_h \right)$$

Whereby

IBSP = Index for biodiversity services payment

VI = Value of importance, measuring species' vulnerability with respect to tree cover requirements and degree of threat

Ab1 = Sum of all individuals of a species in a determined land use

abT = Total richness of species in a landscape (Gamma Diversity)

$\mathbf{Va_h}$ = Value of habitat variables (Tree cover, Number of trees, DBH, etc.) that best explain the richness of species

$\mathbf{S_{ha}}$ = Proportion of the richness in each land use with respect to total landscape richness

Environmental Services Index (ESI)

The projects partners conducted a rigorous procedure to quantify the environmental services provide by each land use system. This process included: the review of current scientific information; consultation with technical experts from the World Bank, FAO (LEAD), CATIE, CIPAV, ABC, and Nitlapán; and multidisciplinary analysis.

The ESI distinguishes 28 different land uses (see Table A9.1). The biodiversity conservation index was scaled with the most biodiversity-poor land uses (degraded pasture and annual crops) set at 0.0 and the most biodiversity-rich land use (primary forest) set at 1.0. Within this range, a panel of experts assigned points to each land use, taking into consideration factors such as the number of species, their spatial arrangement, stratification, plot size, and fruit production. Similarly, the carbon sequestration index assigns points to different land uses according to their capacity to sequester stable carbon in the soil and in hard wood. The index is scaled so that 1 point equals about 10tC/ha/year. As payments in this case come solely from the GEF, only global benefits were included in the ESI.

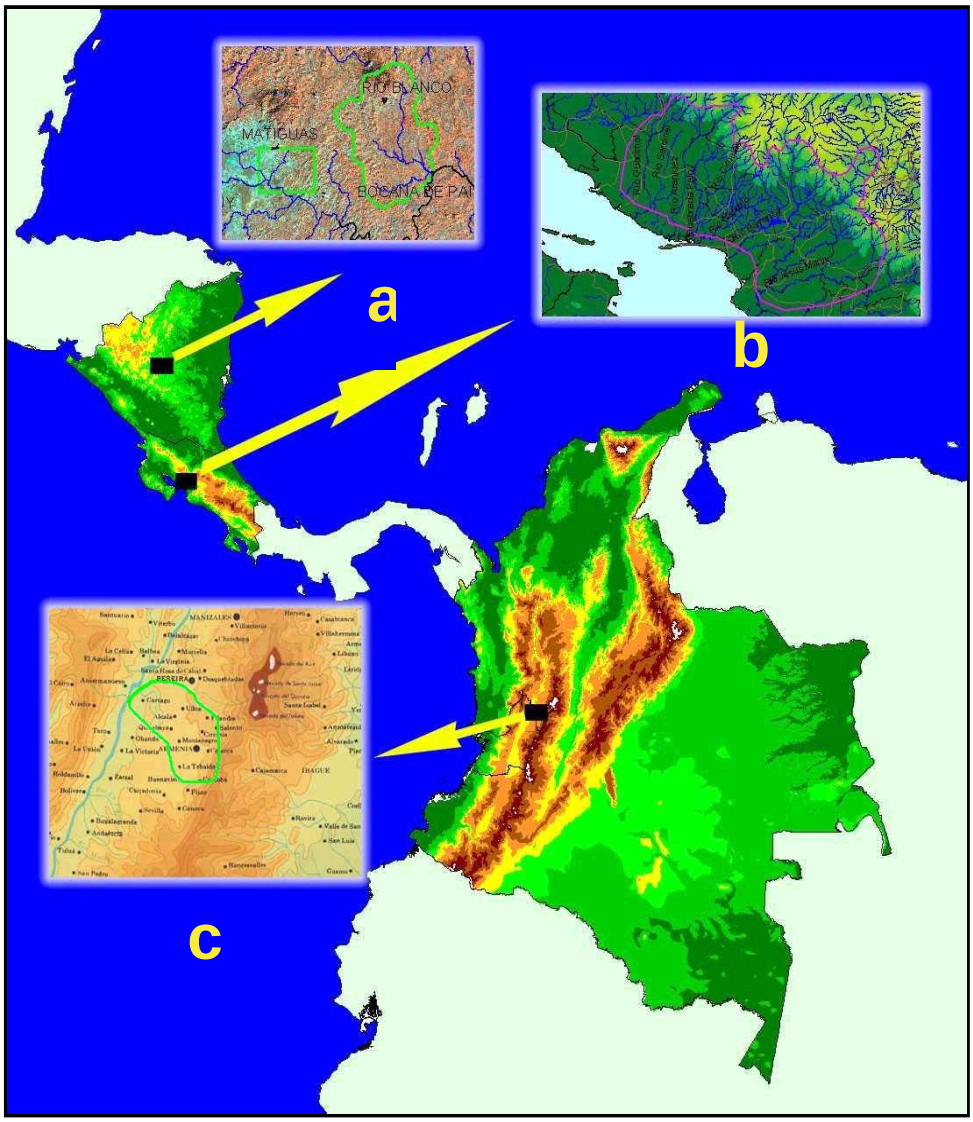
Table A9.1 - Environmental service indices used in the Silvopastoral Project

(Points per hectare, unless otherwise specified)

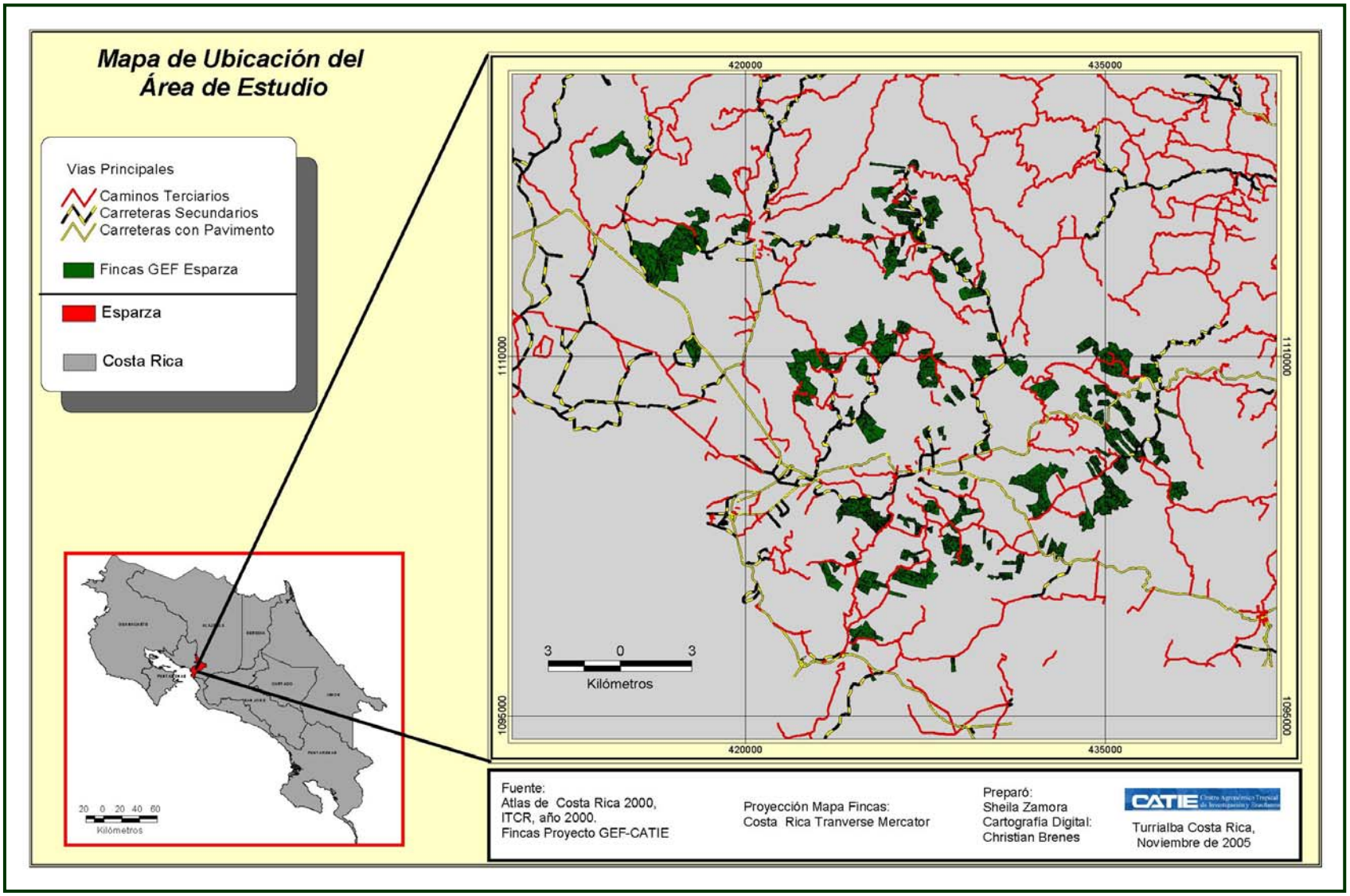
Land use	*Biodiversity index*	*Carbon sequestration index*	*Environmental services Index (ESI)*
Annual crops	0.0	0.0	0.0
Degraded pasture	0.0	0.0	0.0
Natural pasture without trees	0.1	0.1	0.2
Improved pasture without trees	0.4	0.1	0.5
Semi-permanent crops (plantain, sun coffee)	0.3	0.2	0.5
Natural pasture with low tree density (< 30/ha)	0.3	0.3	0.6
Natural pasture with recently-planted trees (> 200/ha)	0.3	0.3	0.6
Improved pasture with recently-planted trees (> 200/ha)	0.3	0.4	0.7
Monoculture fruit crops	0.3	0.4	0.7
Fodder bank	0.3	0.5	0.8
Improved pasture with low tree density (< 30/ha)	0.3	0.6	0.9
Fodder bank with woody species	0.4	0.5	0.9
Natural pasture with high tree density (> 30/ha)	0.5	0.5	1.0
Diversified fruit crops	0.6	0.5	1.1
Diversified fodder bank	0.6	0.6	1.2
Monoculture timber plantation	0.4	0.8	1.2
Improved pasture with high tree density (> 30/ha)	0.6	0.7	1.3
Diversified timber plantation	0.7	0.7	1.4
Scrub habitats (*tacotales*)	0.6	0.8	1.4
Riparian forest	0.8	0.7	1.5
Disturbed secondary forest (> 10 m^2 basal area)	0.8	0.9	1.7
Secondary forest (> 10 m^2 basal area)	0.9	1.0	1.9
Primary forest	1.0	1.0	2.0
New live fence or established live fence with frequent pruning (per km)	0.3	0.3	0.6
Wind breaks (per km)	0.6	0.5	1.1

Notes: The ESI is the sum of the biodiversity and carbon sequestration indices.
Source: Pagiola et al. 2007

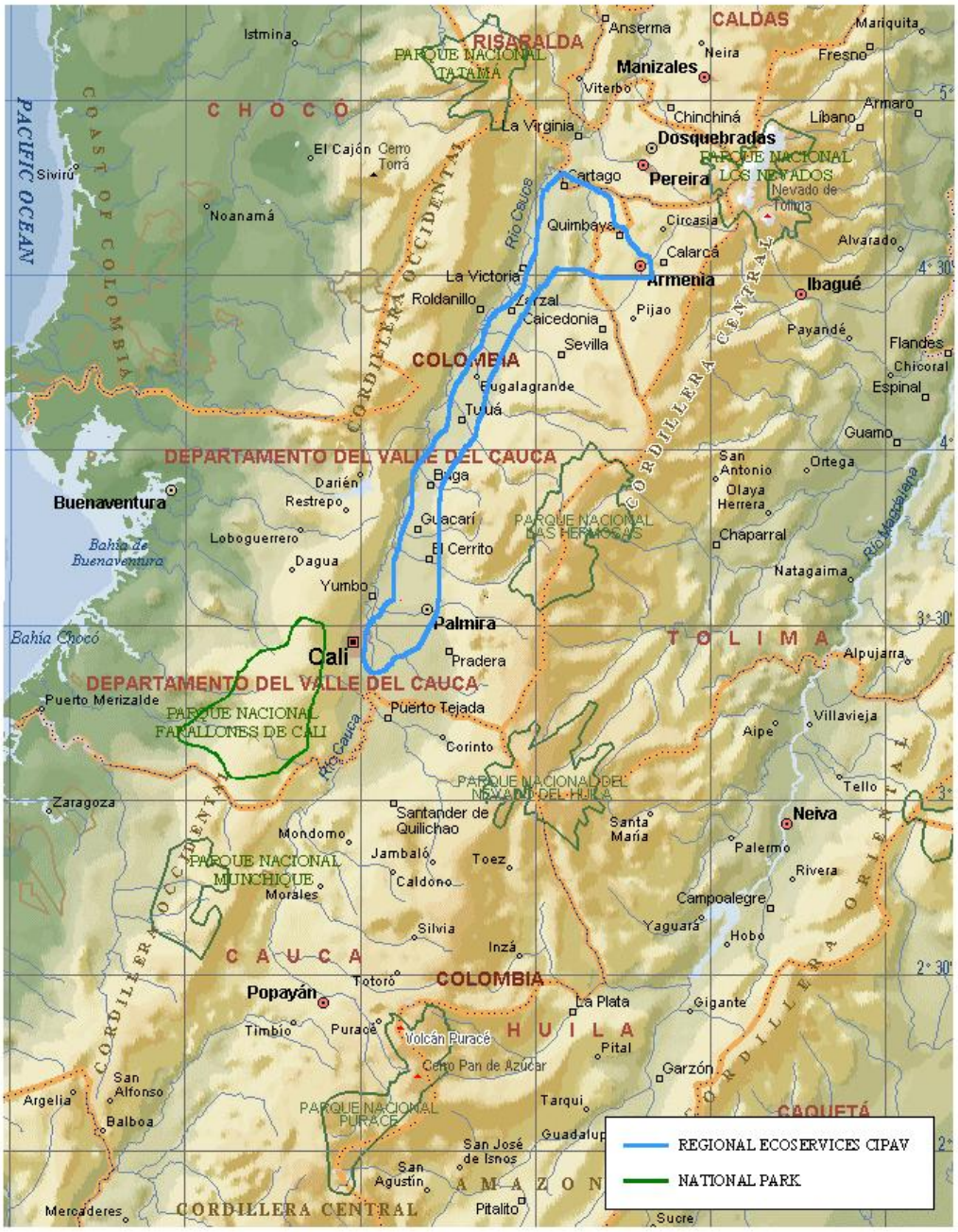
MAPS – Silvopastoral Project Study Sites



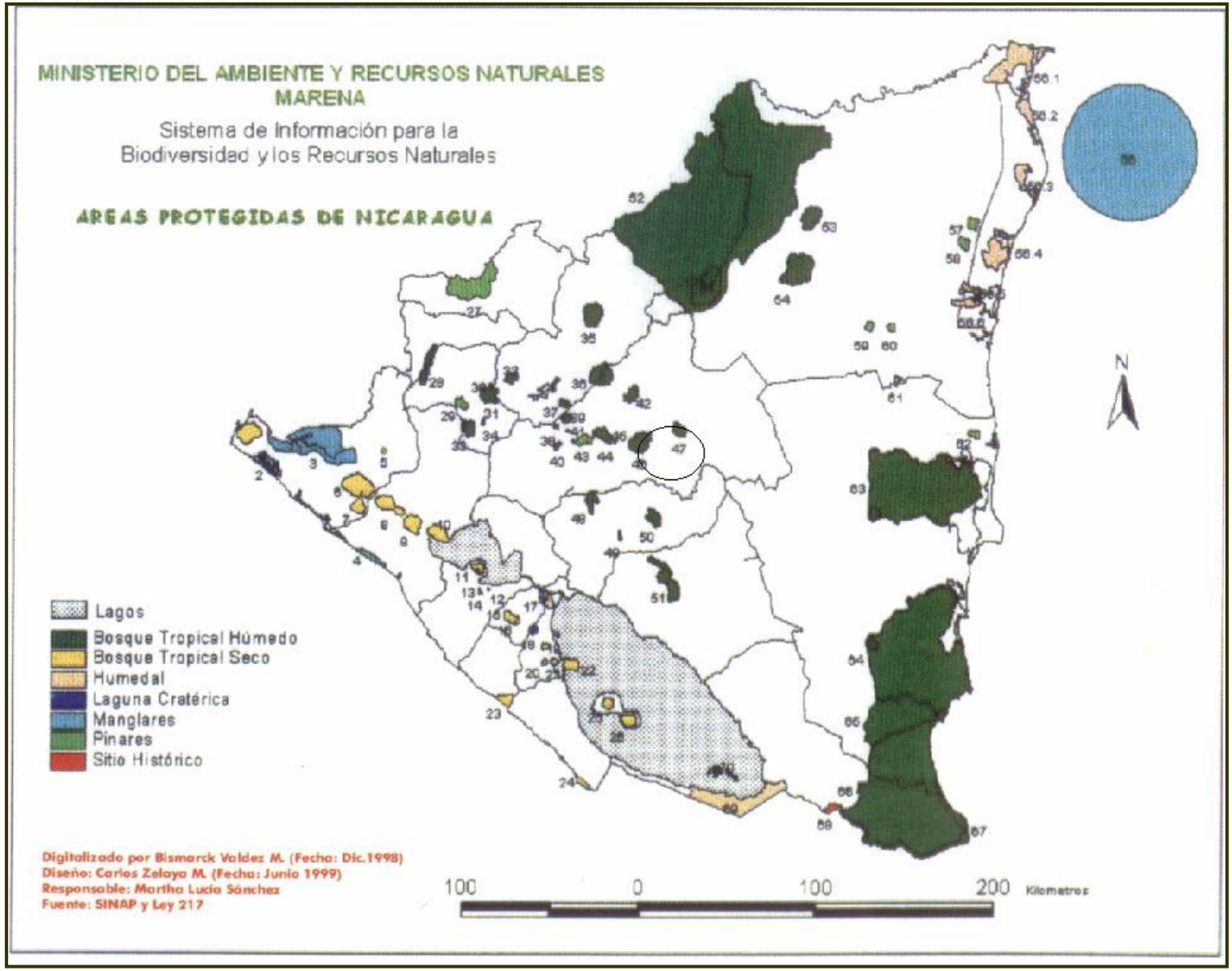
Map 1 - Map of project study sites: a) Matiguás, Nicaragua; b) Esparza, Costa Rica; c) Valle del Cauca, Colombia



Map 2 Location of project sites in Costa Rica



Map 3 Location of project sites in Colombia



Map 4 - Location of project sites in Nicaragua