Final Technical Report

CLIMAFOR Project

R7274

International Pilot Greenhouse Bubble for Forests – Chiapas, Mexico

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Executive Summary

The development of international carbon trading schemes, including the Clean Development Mechanism, has the potential to generate considerable investment into the forestry sector in developing countries. However, economies of scale will tend to favour larger commercial projects unless mechanisms that allow the cost effective aggregation of carbon assets from a range of land use systems are developed. Also, in order to realise the potential social and environmental benefits that could result from the commercialisation of emission reductions from forest management and conservation activities objective methodologies are required for constructing regional carbon baselines for land use change.

R7274 focused on Southern Mexico and built upon the results of a previous project (R6320) that produced the initial Plan Vivo System, a system for the management of carbon services from small-scale producers in a way that promotes sustainable livelihoods. The following outputs were produced from 1998 to 2002:

- The development and testing of Plan Vivo Systems to incorporate administrative and technical protocols to allow cost effective verification of the registration and monitoring of carbon assets from multiple small-scale activities. These protocols aim to reduce the risk associated with carbon offsets from land use projects.

- Capacity building within the Fondo BioClimatico, a regional carbon management institution set up in Chiapas, Mexico in project R6320.

- The development of evidence-based methodologies for constructing regional baselines for carbon emissions from land use change based on an analysis of the relationship between carbon emissions and key predisposing and driving factors. This provides an objective means of setting baselines for forest conservation and management projects and setting appropriate risk buffers for corresponding carbon credits.

- Application of baseline methodologies through the Fondo BioClimatico to calculate the potential of community management plans to offset carbon emissions in Chiapas.

- A verification status review of methodologies used and implications for carbon projects involving small-scale farmers. This concluded that the systems developed have the potential to provide a template for socially beneficial CDM compliant

projects. The review highlighted the need for a balance between the requirement for fully documented decision making and maintaining flexibility of projects that work with a wide variety of stakeholders.

- Dissemination of methodologies to projects in Uganda and Mozambique and the establishment of a new carbon trading project involving small-scale farmers in India.

Background

Carbon trading initiatives, such as the Clean Development Mechanism of the UN Framework Convention for Climate Change (UNFCCC) could provide significant resources for the development of sustainable livelihood systems in rural areas. However, trading in carbon offsets will not necessarily benefit the rural poor for the following reasons:

- unless offset activities are designed in participation with the farmers themselves offset projects could be undertaken in ways that are non-beneficial, or even harmful to the rural poor
- without cost-effective systems for monitoring and regulating carbon sequestration by small-scale activities trading is likely to favour large scale projects
- the limitation of land use activities to afforestation and reforestation for the first commitment period of the Clean Development Mechanism limits the range of forestry activities that rural communities could use within these schemes

This project was designed to address two key development needs -

1. The need for effective methods for measuring the green house gas benefits of forestry projects:

The difficulties associated with setting baselines was one of the reasons why the UNFCCC decided not to include forest conservation projects in the first commitment period of the Clean Development Mechanism (2008-2012) at CoP6a in Bonn in July 2001. Assessing the potential of forest conservation projects to offset carbon emissions requires reference to a baseline scenario that describes the expected state of future carbon stocks in the absence of the project. However, while the calculation of a project baseline has a major influence on the carbon offset potential of forestry activities, pilot projects to date have used varied and inconsistent methods of constructing baselines. If forest conservation activities are to be included in future commitment periods the following concerns must be addressed:

- potential over-estimation of a project's impact by setting pessimistic baseline scenarios (the so called "hot air" problem);
- perverse incentives, such as a disincentive to conserve forests, that would arise from crediting on a project-by-project basis;
- "leakages" of project impacts - that may occur by the displacement of forest conversion activity from one area to another.

2. The need to ensure socio-economic benefits from carbon offset trading:

Most offset projects in the pilot phase of the UNFCCC Activities Implemented Jointly programme have been undertaken with some sensitivity to local development needs. However, once carbon offsets become a tradable commodity there are likely to be strong pressures to obtain credits, possibly at the expense of local considerations. Mechanisms to ensure socio-economic benefits from offset trading must be designed into regional and national systems for terrestrial carbon management:

- regulatory systems should include mechanisms for selecting and promoting projects that contribute to the development of sustainable rural livelihoods;
- local organisations interested in implementing projects must acquire the necessary technical and organisational capacity to deliver carbon offset services and associated social benefits.

Evidence of demand for this research came from various sources. At the international level the World Bank and GEF expressed a need for work relating to standards and procedures for assessing and regulating carbon offset projects. The firm support of 77 developing countries for the implementation of the Clean Development Mechanism within the UNFCCC was also strong evidence for the high priority given to this area of activity. Several countries within the FRP target group had established offices for promoting Joint Implementation under the UNFCC programme for Activities Implemented Jointly. Requests for research outputs and possible collaboration were received from various NGOs and national offices. At the national level in Mexico, the Instituto Nacional de Ecología, which hosts the office responsible for the promotion, assessment and regulation of carbon sequestration projects, requested this research and were involved in the design of the proposal. A number of local institutions in Mexico and India requested assistance with the development of carbon sequestration projects.

The research and training was focused on southern Mexico, which has a large population of poor rural farmers and a considerable potential for carbon sequestration. Tipper *et al* (1998) estimated that it would be possible to sequester approximately 1 Gt C in the states of Chiapas and Oaxaca, at a cost of approximately $US 20 tC^{-1} . An offset programme of this scale could lead to the investment of billions of dollars to the region.

Project Purpose

- Develop a prototype system for managing terrestrial stocks of carbon within a regional GHG bubble, with sequestration capacity in the order of 1Gt C, and an emphasis on the enhancement of sustainable rural livelihoods.
- 4 community forestry projects to be operational in Mexico
- C-management systems under development in >2 other FRP target countries.

Research Activities

Relating to outputs
1. Protocols for transferring resources for sustainable forestry and agroforestry to poor farmers and landless on the basis of carbon sequestration, and
4. Generic guidelines and methods for managing terrestrial carbon:

- International workshop held in Mexico city (Feb 1998) and NGO workshop held in Chiapas, Mexico (Oct 1998) to discuss structure and functions of GHG bubble and requirements for offset projects
- Contribution to IPCC LULUCF special report
- Development of administrative procedures of Plan Vivo System
  - monitoring and carbon accreditation protocols
  - database for managing carbon assets registered by small-scale producers
  - accounting procedures including farmer account books
  - social impact assessment procedure
- Testing of procedures within the Fondo BioClimatico
- International dissemination of Plan Vivo methodology
  - Training and support provided to Women for Sustainable Development to set up a pilot land use and carbon sequestration project with small-scale farmers in Karnataka, India
  - Dissemination of results to institutions in Uganda and Mozambique
- Development of technical specifications for assessment of carbon offset potential of land use systems
  - 7 for Chiapas, Mexico
  - 2 for Southern India
- Trial verification of Plan Vivo System and its implementation by the Fondo BioClimatico in Chiapas, Mexico carried out by SGS
- Revision of Plan Vivo Manual following trial verification

Relating to output:
3. A decision-support system for assigning baseline and project carbon storage scenarios to forests in municipalities within the GHG bubble[1]:

- Collation of spatially referenced data on land use and socio-economic characteristics of 2.7 Mha of Chiapas
- Analysis of land use change and loss of vulnerable carbon in study area 1974-1995
- Analysis between carbon emissions and socio-economic factors
- Construction of baseline matrices for risk of carbon loss 2000-2021
- Test model for predictive accuracy
- International baseline workshop held in Chiapas, Mexico (April 2000)
- Final project dissemination workshop held in INE, Mexico City (Dec 2002)

[1] Note that the use of the term 'GHG bubble' was dropped subsequent to the first project workshop due to political sensitivities over its possible interpretation as a national emissions cap.

Relating to output
2. Management systems for pilot projects within the regional GHG bubble

- Institutional strengthening of Fondo BioClimatico, regional carbon management institution in Chiapas, Mexico
- Selection and preparation of communities to participate in forestry – carbon offset activities
- Production of community land management plans by community with support from project staff
- Construction of baseline for target community
- Assessment of carbon offset potential of community activities

Outputs

A. Development of administrative and technical protocols in the Plan Vivo System and strengthening of the Fondo BioClimatico carbon trust fund
Relating to outputs:
1. Protocols for transferring resources for sustainable forestry and agroforestry to poor farmers and landless on the basis of carbon sequestration
1.2 guidelines for project developer;
1.3 procedures for registering and monitoring projects;
1.4 INE staff trained in the execution of protocols.
4. Generic guidelines and methods for managing terrestrial carbon:
4.2 socio-economic design criteria for offset projects
4.3 methods for assessment of offset capacity of individual sequestration projects
4.4 guidelines for project selection and project development
4.5 project monitoring and administration
4.6 guidelines for organisational development and conflict resolution
4.7 verifiable indicators and verification procedures

The project has continued to work with and strengthen the Fondo BioClimatico, the regional carbon management institution set up in R6320. The FBC has been facilitating the sale of carbon services[2] from farmers in Chiapas, Mexico since 1997. It is responsible for registering and monitoring activities carried out by farmers and the administration of carbon transactions, it also provides technical support to farmers. Annual sales of carbon have risen from approximately 5,000tC in 1997 to 10,000tC in 2001. Purchasers of carbon offsets include the Federacion Internacional l'Automobile, which offsets emissions from Formula 1 racing in Chiapas, and the UK based carbon brokers Future Forests, whose clients include the World Economic Forum, Pink Floyd and members of the general Public. The Fondo BioClimatico has recently been contacted by the Prototype Carbon Fund requesting Voluntary Emission Reductions to offset carbon emissions from World Bank offices and travel.

[2] The Fondo BioClimatico currently sells Voluntary Emission Reductions (VERs), to companies or individuals who wish to offset their carbon dioxide emissions. VERs are not sold through the Clean Development Mechanism and do not involve transfer sovereignty of carbon rights from the originating country.

Sales of carbon from the Fondo BioClimatico now provide some £90,000 per year to farmers implementing forestry activities in Chiapas. The number of farmers involved in the project over this period has doubled to around 400 individuals from 20 communities. The sale of carbon also covers the technical and administrative costs of the Fondo BioClimatico, which is now financially independent of external funding. The FBC are now responsible for all day-to-day management of the project, technical support is provided by the ECCM.

The Plan Vivo System, a system for managing the supply of carbon services from small-scale producers in a way that promotes sustainable rural livelihoods was a research output from the previous FRP project (R6320). R7274 has developed the Plan Vivo System in order to meet identified requirements of stakeholders in the carbon trading process. The system has been revised to incorporate additional procedures that aim to allow cost effective verification of carbon offsets registered through the system, reduce the risk of carbon offsets generated by a project and improve the potential for socially beneficial impacts from the project. Specific outputs are:

- Development of technical specifications of land use systems used in target projects.
- Monitoring and carbon accreditation protocols
- Database for managing registration and transactions of carbon assets
- Farmer account books
- Social impact assessment procedure

The project has used research from previous projects (including studies funded by US Environmental Protection Agency and the International Energy Agency's Green House Gas Research and Development Programme) to develop a number of technical specifications of forestry systems. These specifications give the carbon offset potential of the system and the management actions required to achieve this potential. The evidence behind carbon offset calculations is presented and monitoring targets are stated. These technical specifications are used by the FBC technical team to evaluate the carbon offset potential of all agroforestry activities registered by farmers for providing carbon services. 7 technical specifications for forestry systems used in the Fondo BioClimatico in Mexico have been developed and a further 2 draft specifications have been developed for forestry systems in Southern India (see annexes 1 and 2).

The potential of forestry activities to offset carbon emissions is calculated on the basis of long-term average storage of carbon in the vegetation. This calculation relies on the assumption that forestry system will be maintained for a period of 100 years and that trees will be replanted/regenerated following harvesting. (Note that this accounting method is used in the calculation of Voluntary Emission Reductions, Clean Development Mechanism compliant Certified Emission Reductions may use a different accounting system.) The majority of the costs to the farmer are incurred in the early part of the rotation, and unless income from carbon sales are made available to farmers in the first few years there will be little incentive to implement forestry activities where financial resources are scarce. However, in many cases returns from forestry products will not be realised for a number of years and its is possible that farmers will have little incentive to maintain forestry systems in the medium term if all the income from carbon is paid in the first few years which could increase the risk of carbon benefits being lost from the project.

Monitoring and carbon accounting protocols have been developed that aim to balance the financial needs of the producer and reduce risk of the loss of carbon benefits. Each producer is issued with a carbon account book. Carbon credits are added to the producer account on the basis of monitoring results. Monitoring is carried out in years 1,2,3,5 and 10. If Monitoring targets (specified in the relevant technical specification) are met 20% of the total carbon offset potential of the system (also specified in the relevant technical specification) is credited to the producer. Once carbon has been accredited to the farmer he/she may sell carbon from his/her account. All farmers are required to maintain a 10% risk buffer of unsold accredited carbon to provide extra risk assurance.

In order to improve the accountability of the administration of carbon transactions a database has been developed that includes details of all forestry activities registered with the Fondo BioClimatico, monitoring carried out and carbon transactions. When a purchase places an order for carbon the Fondo BioClimatico makes sale agreements with individual farmers. Sale agreements state the amount of carbon, the price and the timeframe that over which the carbon may be sold, subject to availability. This allows the Fondo BioClimatico to ensure that purchasers will be met by registered carbon in a specified time period. A unique serial code is applied to all carbon sold from the FBC so that carbon supplied to any purchaser to be tracked back to the individual farmer, increasing the reliability and transparency of carbon sales.

(These administrative procedures are described in details in the Operational Manual for the FBC (see annex 3), and are also described in the Plan Vivo online manual www.planvivo.org)

To allow an assessment of the socio-economic impact of the project a community level project impact monitoring protocol has been developed. This methodology was developed in consultation with community technicians working with the Fondo BioClimatico. Community monitoring has 4 objectives within the Plan Vivo System:

1. To facilitate information exchange between participating farmers
2. Identify specific technical issues and training requirements
3. Encourage feedback on the administrative procedures used by the Fondo BioClimatico
4. Provide information on the impacts of the sale of carbon by farmers for investors.

A report on the development of the community monitoring methodology and preliminary results from this procedure is given in annex 4.

B. Regional Carbon Baselines

Relating to outputs

1.1 procedures for setting official baseline and additionality parameters for specific locations;

4.1 guidelines for the establishment of regional baselines

3: A decision-support system for assigning baseline and project carbon storage scenarios to forests in municipalities within the GHG bubble:

3.1 probably based on IDRISI GIS software and AME software;[3]

3.2 Will use existing data supplemented by data supplied by collaborative projects;

3.3 will include methods for assessing the impact of carbon offset projects on poverty.

The results of the regional baseline analysis are given in annexes 5 and 6. This provides information relevant for decision-making concerning the management of terrestrial carbon in the project area and a framework for generating this type of information in other areas.

The study focused on an area of 2.8Mha in Chiapas, and used the observed relationship between previous carbon emissions form land use change and certain key predisposing and driving factors to predict future emissions across the study area. The results show that between 1975 and 1996 approximately 0.8 Mha of forest was lost causing emissions of 86 MtC (to put this in context total annual emission from the UK in 1995 were 150 MtC). The analysis of causal factors showed that distance from roads, distance from agriculture and population density were most strongly related to deforestation in the study area over this period (see table 1).

Table 1 Spearman's correlation coefficients for relationship between deforestation and causal factors of change by region

	Study area	**Highlands**	**Cañadas**	**Selva**
Gradient	0.117	0.900**	0.817**	-0.650
Distance roads	1.000**	1.000**	1.000**	1.000**
Distance agriculture	0.997**	0.988**	0.996**	0.999**
Population density	0.984**	1.000**	1.000**	0.927**
Poverty	0.886*	0.829*	-0.900*	0.771

** Significant at 0.01 level

* Significant at 0.05 level

Two risk matrices were then developed showing the risk of deforestation. Each risk matrix has 12 combined classes and gives the percentage change in forest cover from 1975 to 1996 that occurred each risk class. The matrices show a trend for increasing deforestation from low to high population density, for increasing distance from roads and for increasing distance from agriculture. See tables 2 and 3.

[3] Please note that the proposed methodology was revised. A simple matrix model was used in place of the AME software in order to increase the ease of replication of the results of the analysis. ArcInfo GIS software was used instead of IDRISI.

Table 2 Risk matrix for population density and distance from roads – risk given as percentage deforestation in class 1975-1996

		Distance from roads (m)		
		0 - 1000	**1000 - 2000**	**>2000**
Population density (hab/km2)	**>30**	77.79	61.78	41.72
	>15 a 30	66.72	50.13	33.72
	>0 a 15	54.92	38.20	24.16
	0	42.83	25.43	6.69

Table 3 Risk matrix for population density and distance from agriculture– risk given as percentage deforestation in class 1975-1996

		Distance from agriculture (m)		
		0 - 500	**1500 - 1000**	**>1000**
Population density (hab/km2)	**>30**	62.7	52.2	47.8
	>15 a 30	54.7	42.1	36.4
	>0 a 15	47.7	33.8	26.3
	0	39.7	27.3	10.8

Application of carbon baseline methodology within the Plan Vivo System in pilot projects in the Fondo BioClimatico

Relating to outputs:

2. Management systems for pilot projects within the regional GHG bubble (including)

2.1 an institutional framework comprising an offset trust fund, local technical team, local users representation body, and an organisational / conflict management team;

2.2 use of the Plan Vivo methodology and software for development of working plans, monitoring of progress and administering carbon transactions;

2.3 a programme of basic and specialist training.

The project worked with 5 communities to develop community level land management plans

- Juznajab
- Rincon Chamula
- La Corona
- Jitotol
- Reforma Agraria

The chief difficulty encountered in developing community level plans has been the level of social cohesion within communities. Although there are a number of community forestry projects in operation in the neighbouring state of Oaxaca due to historical social and political reasons there are very few examples of successful community forest management in Chiapas despite the fact that many communities have substantial forest resources. Of the five communities that the project has worked with only La Corona, and more recently Rincon Chamula and Reforma Agraria, have been able to develop viable community level plans.

A forest management plan was developed for Juznajab, however the community was unable to implement of the plan due to differences between groups affiliated with different farmer's unions in the region. The Fondo BioClimatico has continued to work with individuals in the community and recently has registered a community afforestation plan. This may help build community organisation and eventually allow the implementation of the community forest management plan.

La Corona, Ricon Chamula and Reforma Agraria are developing integrated management plans involving the conservation and management of forest resources and improvement of agricultural production systems with the aim to promote livelihoods and conserve forest resources. The forest management activities in La Corona began in 2000 and implementation in Ricon Chamula and Reforma Agraria is expected in 2002. A report of the workshop held in La Corona to help the community produce a 'plan vivo' management plan is given in annex 7. Activities being undertaken by the community in the respect include:

- Restoration of fire damaged forest
- Protection of existing forest areas through the establishment of fire breaks
- Use of leguminous cover crops in agriculture
- Improvement of pasture

The report on the baseline methodology in annex 6 includes details of the carbon baseline calculated for the community of La Corona. A brief summary is given below:

The community of La Corona covers 2,274ha of which 1,238ha is forest cover; total vulnerable carbon is 308,417 tonnes. The expected carbon emissions 2000-2021 from La Corona calculated using the regional baseline matrices of carbon risk are 78,991 tC (see table 4). In theory, therefore, if the forest resources of La Corona could be conserved 78,991t of carbon emissions could be avoided over the next 21 years.

Table 4: Predicted emissions from the community of La Corona 2000-2021 (tC)

		Distance from roads (m)		
		<1000	**1000-2000**	**>2000**
Population density (/km2)	**>30**	0	0	0
	15-30	1,802	1,409	0
	0-15	7,034	15,122	8,829
	0	21,311	10,467	13,017

Based on the methodology detailed in the baseline methodology (annex 6) a risk buffer of 11.5% vulnerable carbon should be set for a community of the size of La Corona, equal to 35,468tC. The predicted offset potential of conserving forest resources in La Corona 2000-2021 is therefore 43,523tC.

C. Trial verification of the Plan Vivo System

Related to outputs:
2.4 protocols for external verification
2.5 improvement of Plan Vivo System to enable cost effective verification

A trial verification of the Plan Vivo System and its implementation in the Fondo BioClimatico in Mexico was carried out by SGS in Dec 2001 (see annex 8 Plan Vivo System Verification Status Review). The main findings were as follows:

- The Plan Vivo System has great potential for use in developing Clean Development Mechanism compliant projects. In particular, activities implemented under the Plan Vivo System are highly likely to be additional, suffer from little leakage and, if certain conditions are met, they have a good chance of being permanent.
- The Fondo BioClimatico has been successful in establishing a range of forestry and agroforestry systems by working with farmers and rural communities. The Fondo BioClimatico systems and procedures cover most of the requirements of the Plan Vivo System, but further work is required to define the essential procedures in a way that will make them cost-effective to independently verify.
- There are also numerous inconsistencies between the documented procedures of the Fondo BioClimatico and actual implementation in the field and office. These inconsistencies are mainly due to:

  a) the fact that the systems have been (and to some extent still are) under development, and numerous changes to carbon accounting, monitoring and payment procedures have been made over the past 5 years;

  b) lack of clear structure for decision-making and information gathering in certain aspects of the system - notably regarding decisions on which farmers may enter the project and on the staging of payments;

  c) lack of narrative descriptions or field notes to explain numerous changes to management plans (plan vivos);

  d) reliance on a few key staff members who rely on their experience for much of the operational detail;

  e) differences in interpretation between some staff / local assistants of some vegetation classes used for monitoring and baseline-setting.
- The Plan Vivo System Manual provides useful guidance for project developers seeking to implement carbon management projects in rural areas where the actors are numerous smallholder farmers / communities but in its current form is not suitable as a tool against which to independently verify the implementation of the Plan Vivo System. This is mainly because there is insufficient clarity about which actions / procedures are just recommended or advisable and which are actual requirements for conformity with the Plan Vivo System.
- The technical specifications against which carbon benefits of the activities promoted by the Fondo BioClimatico are assessed are a valuable resource that can generate benefits of scale and quality for organisations implementing carbon management forestry systems. However, these specifications require further development to provide

  a) necessary information about the economics of the forestry systems concerned;

  b) greater transparency regarding the assumptions and sources of data used to make carbon uptake and storage estimates.

- Although the assessment team has experience of a range of projects the particular combination of community-based organisations planting exclusively indigenous species for a productive / commercial return demonstrated by the Fondo BioClimatico is new to the team.

The Plan Vivo Manual (www.planvivo.org) has been revised to take account of the recommendations of the verification report. A process of stakeholder consultation over the proposed changes is currently in process and the revised manual will be published in April.

D. Dissemination of Results and methodologies

Relating to outputs:

1.5 dissemination of protocols to >4 other relevant institutions in FRP target countries

3.4 will be disseminated to relevant FRP target country institutions.

4.8 initial assessment of potential scope for terrestrial carbon management and associated socio-economic benefits in key FRP target countries

Dissemination was carried out through:

Workshops and presentations

3 international workshops were held during the course of the project

1. Start-up workshop, held at the British Council, Mexico City, Feb 1998
2. Regional carbon baseline workshop, Chiapas, Mexico, April 2000
3. Final project workshop, Instituto Nacional de Ecología, Mexico City, Dec 2002

Details of the baseline workshop and the final project workshop are available on the project website www.eccm.uk.com/climafor The results of the regional baseline research were also presented at the IUFRO International Conference on Carbon Sequestration held in Merida, Venezuela in July 2001

National workshops have included:

1. NGO workshop, Chiapas, Oct 1998
2. Workshop for SEMARNAP staff working La Selva Biosphere reserve, 2001

Local dissemination has been carried out mainly via workshops and training sessions with farmer's groups and community associations in Chiapas and the neighbouring state Oaxaca. The Fondo BioClimatico now works with 5 separate organisations in these states.

Training of rural development organisations in target countries

Specific training activities were carried out in three target countries: India, Mozambique and Uganda. NGO's were selected for these training activities based on their potential to successfully implement a livelihood focused carbon forestry project. Criteria for selection included:

- Involvement in small-scale land use and forestry activities

- Technical capacity within the organisations
- Links to research institutions to carry out biomass surveys and carbon modelling

Training activities in India with the NGO Women for Sustainable Development has led to the establishment of a new carbon trading project. Women for Sustainable Development works with small-scale farmers in the state of Karnataka and are promoting integrated water management and agroforestry activities. Since the beginning of its carbon project in 2000 Women for Sustainable Development has facilitated the sale of around 2000tC from 70 farmers who have received funds to establish mango and tamarind orchards through the project. Women for Sustainable Development has also begun to commercialise carbon offsets generated by small-scale rural renewable electricity generation.

In Mozambique training focused on an NGO working with a community in the buffer zone of the Gorongosa National Park. In contrast to the Women for Sustainable Development project this would require substantial non-carbon start up funding as the proposed project involved community level forest management and GIS work to establish regional carbon baselines. Proposals have been submitted to the European Union and Global Environment Facility involving the Department of Forestry and Wildlife in Mozambique and the International Centre for Research on Agorforestry in Zimbabwe. Trip reports form training visits to India and Mozambique are given in annex 9.

Publications

Key dissemination publications include:

- Contribution to IPCC Special Report on Land Use Change
- Contribution to FAO State of the World's Forests 2001
- Article in the *Financial Times Weekend* November 2000

A full list of publications is given below.

Contribution of Outputs

The growing international market in carbon services, notable through the Clean Development Mechanism of the Kyoto Protocol, has the potential to generate a large level of investment into the forestry and land use sector in developing countries. The potential benefits of diversifying production systems through forestry activities are well documented. Potential benefits include increased long-term income, a range of domestic products and environmental services such as soil and water conservation. However the start-up costs of these activities are often prohibitive for the rural poor. The ability of afforestation and forest management to offset carbon emissions in other sectors can generate additional sources of income early in the rotation and help cover these start-up costs. However, until certain key technical constraints are overcome the potential flow of benefits to the rural poor will be limited.

Although the Clean Development Mechanism explicitly states that activities must contribute to the sustainable development priorities of host countries, economies of scale and costs of generating the information necessary to measure carbon uptake will tend to favour large-scale forestry projects using a low diversity of species and management regimes. In addition to this the exclusion of forest conservation from the first commitment period of the Clean Development Mechanism (2008-2012) further limits the flow of benefits to rural communities that wish to implement sustainable land use practises.

This project has provided new knowledge that has the potential to increase income production among the rural poor through the commercialisation of carbon assets from socially beneficial forestry and agroforestry activities, specifically through the development of:

- evidence based methodologies for constructing regional carbon baselines and setting appropriate risk buffers for carbon offsets generated by forest management projects
- planning methods that allows small-scale producers to plan carbon offset activities around their own need and resources
- technical and administrative systems that allows the cost effective, verifiable registering and monitoring of a range of small-scale activities.

The project has been developed and results tested through the Fondo BioClimatico carbon management trust fund based in Chiapas, Mexico that now generates around £90,000 per year for the implementation of forestry activities by small-scale producers in the project area. Research results have also been promoted through dissemination and training activities which have led to the establishment of one new carbon-forestry project in Southern India and expressions of interest from other NGO's working on rural-development and forestry projects.

List of publications:

Castillo, M., Hellier, A., Tipper, R. and de Jong, B. (submitted). Carbon emissions from land use change: a regional analysis of causal factors in Chiapas, Mexico. *Mitigation and Adaptation Strategies for Global Change.* (Peer reviewed paper).

Hellier, A., Castillo, M., Tipper, R. and de Jong, B. (submitted). Constructing regional baselines for carbon emissions from land use change in Chiapas, Mexico. *Mitigation and Adaptation Strategies for Global Change.* (Peer reviewed paper).

Tipper, R. (in press) Scolel Té: a case of indigenous farmers participating in the international market for carbon services. In: *Selling Forest Environmental Services: Market-based Mechanisms for Conservation.* Pagiola, S., Bishop, J. and Landell-Mills, N. (eds). (Book chapter)

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Hellier, A., McGhee, W., Tipper, R., Mayhew, J., Malhi Y. and Meir, P. (2001) Climate Change and Forests. pp. 60-73. In *State of the Worlds Forests 2001* FAO, Rome, Italy. English, French and Spanish. (Book chapter)

Tipper, R., McGhee, W. and Hellier. A. (2000). Land use Change and Forestry Activities and the Clean Development Mechanism. ECCM Policy Paper. No. 1. <www.eccm.uk.com/cdmdebate.pdf> (Electronic media)

De Jong, B., Tipper R. and Montoya G. 2000. An economic analysis of the potential for carbon sequestration by forests: evidence from southern Mexico. *Ecological Economics* 33: 313-327. (Peer reviewed paper).

S. Brown, O. Masera, J. Sathaye, *et al.* (2000) Project-Based Activities. pp. 283-338 in *Land Use, Land-Use Change, and Forestry*. Watson, R.T., I.R. Noble., B. Bolin, N. H. Ravindranath, D. J. Verardo and D. J. Dokken, eds. A Special Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. (Book Chapter).

Internal Reports

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ECCM. (2000) CLIMAFOR website. <www.eccm.uk.com/climafor> (Electronic media)

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Other Dissemination of Results

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Annexes

1. Technical specifications for forestry systems used in Chiapas, Mexico
2. Technical specifications for forestry systems used in Southern India
3. Operational Manual for the FBC
4. Report on the development of the community monitoring methodology
5. Carbon emissions from land use change: a regional analysis of causal factors in Chiapas, Mexico
6. Constructing regional baselines for carbon emissions from land use change in Chiapas, Mexico
7. Report of the workshop held in La Corona to help the community produce a 'Plan Vivo' management plan.
8. Plan Vivo System Verification Status Review.
9. Trip reports form training visits to WSD in India and from Mozambique
10. Tipper, R. (in press) Scolel Té: a case of indigenous farmers participating in the international market for carbon services.
11. Hellier, A. *et al* (2001) Climate Change and Forests. Contribution to FAO State of the World's Forests 2001
12. Tipper, R. *et al* (2000). Response to a letter by a group of prominent NGOs to the US Under Secretary of State for Global Affairs concerning the Kyoto Protocol's Clean Development Mechanism.
13. De Jong *et al* (2000) An economic analysis of the potential for carbon sequestration by forests: evidence from southern Mexico.
14. DTZ Pieda project evaluation report
15. Financial Times 'Carbon Trappers' article