PROJECT IDEA NOTE

Project Idea Note (PIN) for Land Use, Land-Use Change and Forestry (LULUCF) Project

Name of Project: Reforestation for Energy and Carbon Sequestration Purposes in Degraded Areas in Loja & El Oro (Reforestation Component)

Date: July,4th, 2005

A. Project description, type, location and schedule

General description	
Objectives of the project	To create a sustainable timber resource in highly degraded areas of Southern Ecuador in common partnership with landowners and public and private investors, with the aim of carbon sequestration and producing biomass to be used for energy purposes.
A.1 Project description and proposed activities	The project considers reforestation of a total of 12,000 ha of degraded land within a period of 15 years. 50% of the area would be reforested with native species such as algarrobo (*prosopis juliflora*) and faique (*acacia macracanta*), while the other 50% of the area would be reforested with exotic species (*Eucalyptus globulus*). Planted forests will be harvested periodically and biomass would be used for electric energy production. The forests will supply biomass for a 4 MW power plant that will be installed fourth after the project start. At the 8th year, the power plant will be expanded to 8 MW. Depending on energy demand and global biomass markets, the project might also consider sales of biomass for producing energy overseas or for been used directly in the industry.
A.2 Technology to be employed	The project includes the following activities: 1) Build a forest nursery that will consider: i) certificate of origin for seeds, ii) production under closed greenhouses, iii) using a substrate that includes a mixture of local organic products such as sugar cane and rice-shells. iv) Partially mechanized production. 2) Land preparation: given the high stage of land degradation, there is a special focus on soil regeneration. After a screening of soil properties for each plot, soil regenerators are added for hydro-regulation, increase concentration of nutrients, de-compacting and aeration. 3) Improve road access to planting areas. 4) Plantation management, which includes weeding, fertilizing, fire control and pest control. 5) Biomass harvest. Sustainable harvesting practices are used. Rotation intervals are 12 years for native species. For eucalyptus there are 3 cutting cycles with re-growth (4 years each). 6) Monitoring. It takes place annually and includes a general assessment of tree-growth, evaluation of soil properties, evaluation of forest fire prevention and the presence of pests and diseases.

Project proponent submitting the PIN	
A.3 Name	CORMADERA
A.4 Organizational category *(choose one or more)*	Non Governmental Organization
A.5 Other function(s) of the project developer in the project *(choose one or more)*	Project participant, technical advisor.
A.6 Summary of relevant experience	Since 1986, CORMADERA has contributed to the development of the forestry sector in Ecuador by means of research and development of new seeds, and the establishment of tree plantations in the Coastal, Andean and Eastern Regions of Ecuador. CORMADERA has worked together with the public and private sector for the enhancement of sustainable forest practices in Ecuador.
A.7 Address	CORMADERA Calle Cóndor OE-318 y Elia Liut Quito Ecuador
A.8 Contact person	Pablo Mateus; Diego Pinto
A.9 Telephone / fax	Phone: 593-2-2434919 ; Fax: 593-2-2434919
A.10 E-mail and web address	pablo.mateus@cormadera.org; administracion@cormadera.org Web: www.cormadera.org
Project Participants *(List and provide the following information for all project sponsors)*	
A.11Project participants	Project participants include: CORMADERA, landowners, Municipalities, private investors ,and a carbon buyer. A fiduciary trust is proposed for the project financial management.
Type of project	
A.16 Greenhouse gases targeted	CO_2
A.17 Type of activities	CO_2 Sequestration
A.18 Field of activities (*Select code(s) of project category(ies) from the list*)	Afforestation and Reforestation: 1a. Rehabilitation of degraded lands to forest.
Location of the project	
A.19 Country and Region	Ecuador, South America
A.20 Nearest cities	Loja and Machala
A.21 Precise location	Located in the Ecuadorian Highlands in the Municipalities of Olmedo and Chaguarpamba, Loja Province.
Expected schedule	
A.22 Earliest project start date *(Year in which the project will be operational)*	2007
A.23 Estimate of time required before becoming operational after approval of the PIN	18 months
A.24 Year of the first expected CER delivery	2012

A.25 Project lifetime *(Number of years)*	26
A.26 Current status or phase of the project	a. Pre-feasibility study in process.
A.27 Current status of the acceptance of the project by the Host Country *(choose one)*	Letter of Endorsement is under discussion
A.28 Position of the Host Country with regard to the Kyoto Protocol *(choose one)*	Ecuador has ratified the Kyoto Protocol 20/dic/1999 (R.O. No. 1588) as well as the UNFCCC on 07/nov/94 (R.O. No. 562).

B. Expected environmental and social benefits

Environmental benefits

B.1 Estimate of carbon sequestered or conserved. *(in metric tonnes of CO_2 equivalent – t CO_2e)*

The temporary CER method is used for accounting carbon benefits. Based on the project´s carbon sequestration profile, the amount of tCER credits delivered by the project are estimated (see Appendix II). delivered and their validity time are as follows.:

year	*tCER delivered, tCO_2e*	*validity time of tCER, years*
2012	177,462	5
2017	516,825	5
2022	531,270	5
2027	191,907	5

B.2 Baseline scenario *(What would the future look like without the proposed project? What would the estimated total carbon sequestration / conservation be without the proposed project? Mention the baseline methodology, as per the CoP9 text.[1] Also explain why the project is additional referring to the EB16 guidelines[2]).*

The baseline scenario is no-forest land use. This was determined following the COP9 baseline methodology “B) Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment”. Economic analysis shows that tree-plantations are not economically attractive when the only source of income is related to timber. In addition there exist barriers to investment for plantation projects like the absence of loans.

B.3 Existing vegetation and land use *(What is the current land cover and land use? Is the tree cover more or less than 30%?)*

Existing vegetation and land use is a mixture of pastures covered with *kikuyo* grass and shrubs. Sparse trees are present in some of the selected plots for afforestation. Tree crown cover is below 30%.

B.4 Environmental benefits

B.4.a Local benefits

- Protection of watersheds. This is a major issue given increasing water scarcity on the region.
- Erosion control and prevention of desertification process that are currently expanding in Southern Ecuador.
- Reduction of air pollution by avoiding grass burning

[1] http://cdm.unfccc.int/Reference/Documents/dec19_CP9/English/decisions_18_19_CP.9.pdf
[2] http://cdm.unfccc.int/EB/Meetings/016/eb16repan1.pdf

B.4.b Global benefits	- Prevention of desertification. - Protection and recovery of biodiversity by using mixed plantation with indigenous species.
B.5 Consistency between the project and the environmental priorities of the Host Country	This project will help to prevent desertification process in Southern Ecuador, which is a major environmental concern of Environmental Authorities. In addition, afforestation and reforestation programs follow the goals that have been agreed at the peace treaty between Peru and Ecuador signed in 1998 under the *Plan Binacional.*
Socio-economic benefits	
B.6 How will the project improve the welfare of the community involved in it or surrounding it. What are the direct effects which can be attributed to the project and which would not have occurred in a comparable situation without that project? *(e.g., employment creation, poverty alleviation, foreign exchange savings).* Indicate the number of communities and the number of people that will benefit from this project.	Afforestation and Reforestation helps to protect soils in highly eroded areas. This is very important for the economic development of community and private owners living in the region. Economic crisis and lack of investment are leading to the impoverishment of the region and the extraction of natural resources. The project will create employment through reforestation and economic activities will shift towards the sustainable management of forests. In addition, the technical assistance provide by the project will not only help forest management, but also to improve agricultural practices in the areas surrounding the forests. Without this project, people will continue with overgrazing activities that lead to a decrease on agricultural output and emigration to urban areas will continue.
B.7 Are there other effects? *(e.g., training/education due to the introduction of new technologies and products, replication in the country or the region)*	Communities will benefit from training programs on sustainable forest management. This would lead to the expansion of similar programs to adjacent regions. Local labor will be trained, such that latest forestry technologies are taken into practice.

Project costs	
Summary of total costs and revenues of the project (see Appendix 3 for details)	The following table summarizes major costs and revenues of the project: Undiscounted Costs and Revenues:

Cost / Revenue	Total, Undiscounted US$
Project Costs , excl. Carbon, US$	14,580,400
Carbon validation, monitoring and certification costs, US$	605,000
Timber and Land Revenues US$	27,814,373
Carbon Revenues, US$	4,909,504
Net revenues, including carbon, US$	17,538,477

Indicative tCER price	All tCER credits produced in the project are valid for five years and the price is US$ 4.3 /tCO_2e.

<table>
<tr><td>Emission Reductions Value
(= price per t CO_2e * number of tCO_2e)
(see Appendix 3 for details)</td><td>
<table>
<tr><th>year</th><th>tCER (tCO_2e)</th><th>Carbon tCER Revenues, US$</th></tr>
<tr><td>2012</td><td>141,970</td><td>614,654</td></tr>
<tr><td>2017</td><td>413,460</td><td>1,790,065</td></tr>
<tr><td>2022</td><td>425,016</td><td>1,840,098</td></tr>
<tr><td>2027</td><td>153,526</td><td>664,687</td></tr>
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</td></tr>
<tr><td>Sources of finance to be sought or already identified</td><td>Private landowners and communities participating in the project will contribute with the land requirements. This investment equals US$ 1,575,000.</td></tr>
<tr><td>Financial analysis .
Internal Rate of Return, IRR</td><td>IRR without carbon: 8.8%

IRR with carbon: 14.3%</td></tr>
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Appendix I. Project Location.

Appendix II. Estimation of Carbon Uptake

- Carbon uptake in forests is estimated as a function of timber volume. The general equation for estimating biomass is,

$$Biomass\ per\ hectare,\ B\ (t/ha) = V \cdot Bf$$

where biomass per hectare (*B*) in a forest includes the dry weight per ha of stem, branches, leaves and roots, for all trees in the forest. *Bf* is the biomass expansion factor that is defined as the ratio of all stand biomass to growing stock volume and it is measured in metric tons of biomass per cubic meter of timber (t/m3). *Bf* is used for converting timber volume to mass and accounts for noncommercial components, such as branches, roots and leaves.

- According to Fang et al. (2001), the biomass expansion factor is a function of timber volume, as follows,

$$Bf = a + b/x$$

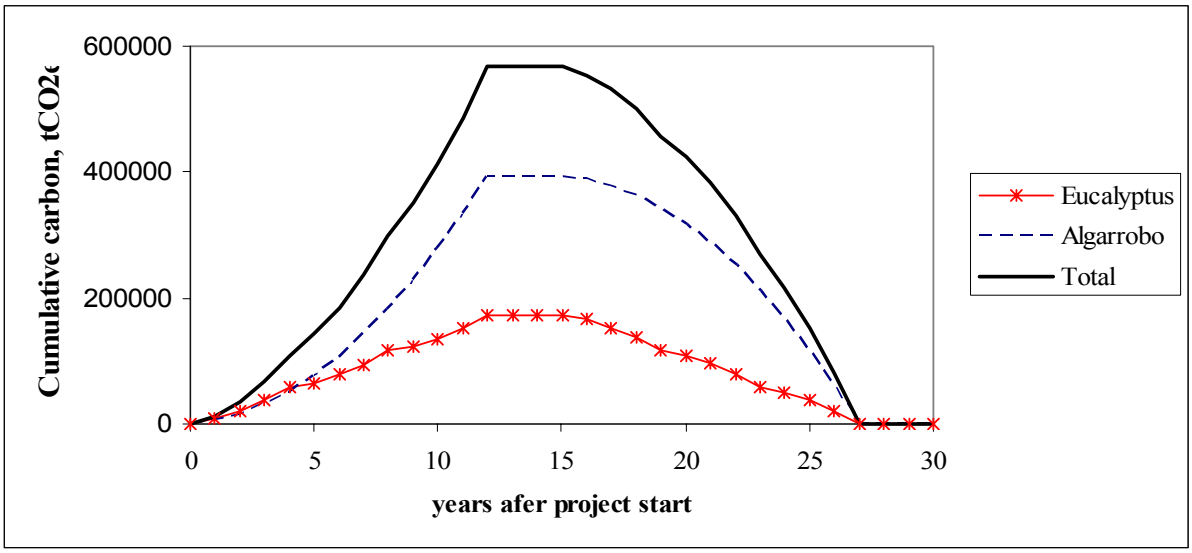
where *x* is timber volume, measured in m3/ha; *a* and *b* are constants that depend on tree specie.

- Carbon accumulation measured in tC/ha, is the biomass density (*B*) divided by 2 according to IPCC guidelines. For having it in tCO_2/ha units, it should be multiplied by 3.667.

- Data for estimating carbon accumulation is shown in the following table,

Parameter	Value	Remarks
For Eucalyptus globulus:		
Parameter *a* for Bf function	0.8873 t/m3	Reference: Fang et al. (2001)
Parameter *b* for Bf function	4.5539 t	
Rotation intervals	4 years	(3 rotations of 4 years each)
Mean annual increment	7.3 m3/ha/yr	
Baseline	5 % with respect to the forest-scenario	
Carbon uptake in soils	Not included	Given the lack of data, carbon uptake in soils is not included. However, it is expected to be a carbon pool of relevance.
Total planting area	6000 ha	
Planting rate	400 ha/yr during 15 years	
For Algarrobo and Faique:		
Parameter *a* for Bf function	0.7975 ton/ha	Average value for tropical species. Reference: Fang et al. (2001)
Parameter *b* for Bf function	0.4204 m^3	
Rotation intervals	12 years	
Mean annual increment	9 m3/ha/yr	
shoot-to-root ratio	25%	
Baseline	Zero	
Carbon uptake in soils	Not included	
Total planting area	6000 ha	
Planting rate	400 ha/yr during 15 years	
Project lifetime	26 years	

On the basis of these parameters, carbon accumulation is estimated for the whole plantation. This results on the following carbon accumulation profile,



Based on the carbon accumulation profile, the amount of tCER delivered by the project are estimated.[3] We consider that verification will take place every 5 years and that tCER are delivered at the end of commitment periods. This leads having tCERs of 5 years validity. At year five after the start of the project, 142,000 tCER are delivered, which are valid till year ten. At year ten, 414,000 tCER are delivered. which are valid till year fifteen. At year fifteen, 425,000 are delivered which are valid till year twenty. Finally, at year twenty, 153,000 tCER are delivered which are valid till year twenty five.

[3] tCER's deliveries are estimated according to the following equation:
$tCER_t = Min(C_t, C_{t+5})$. Where $tCER_t$ is the amount of tCER delivered at time t, C_t is the net cumulative carbon at time t and C_{t+5} is the cumulative carbon at time t+5. All measured in tons of CO_2. Further details on how to estimate lCER and tCER credits for AR-projects are provided in Olschewski and Benítez (2005) .

Appendix III: Summary of the Financial Analysis

- *Reforestation Costs per hectare*

**For eucalyptus:*

	Year 0	Year 4	Year 8
Land	150		
Land Preparation	230		
Fences	72		
Planting	296		
Fertilizing	103	103	103

**For algarrobo and faique:*

	Year 0	Year 6
Land	112	
Land Preparation	230	
Fences	72	
Planting	203	
Fertilizing	102	102

At the end of the project (year 26), land is sold at the same price is bought.

- *Timber revenues*

The project considers selling biomass for energy.
For estimating the equivalent value of one ton of biomass stumpage, we consider the following:

**For eucalyptus*

Commercial Biomass harvested at years 4, 8 and 12 (green-ton per year)	35
Biomass price ($ per green ton)	55
Harvesting and processing costs ($ per green-ton)	7
Transport costs ($ per green-ton)	17
Stumpage Biomass price ($ per green-ton)	31

**For algarrobo and faique*

Commercial Biomass harvested at year 12 (green-ton per year)	64.8
Biomass price ($ per green ton)	41.3
Harvesting and processing costs ($ per green-ton)	4.8
Transport costs ($ per green-ton)	18.8
Stumpage Biomass price ($ per green-ton)	17.7

- *Validation, monitoring and verification costs*

The costs for project design, validation, monitoring and verification are obtained from Locatelli and Pedroni (2005). The following table shows the values used for this study:

Carbon Project Design and validation costs	US$ 120,000
Monitoring	US$ 13,600 each year*
Verification	US$ 45,000 every five years

* It considers US$10000 plus 0.3 per each hectare of the project

- *Carbon benefits*

Carbon prices for CDM-AR projects are lower than market prices for (permanent) emission reductions given the temporary nature of CDM-AR offsets. Current GHG transactions are taking place at a price of about US$ 20/tCO_2e (Point Carbon, 2005). This value, which corresponds to permanent emission offsets, is taken as a reference for estimating the equivalent price for tCERs. This yields to the following revenue table,

year	tCER (tCO_2e)	validity time of tCER (years)	tCER price, US$/$tCO_2e$	Carbon tCER Revenues
5	141,970	5	4.3	614,654
10	413,460	5	4.3	1,790,065
15	425,016	5	4.3	1,840,098
20	153,526	5	4.3	664,687

* The ratio between tCER and lCER prices is estimated as follows: Equivalent factor = $1-1/(1+r)^T$, where r= discount rate in Annex I countries (5% is considered) and T= validity time of lCER. Refer to Olschewski and Benítez (2005) for details.

5. Cash flow and IRR

year	Project Costs, excl. Carbon, US$	Project Revenues, excl. Carbon, US$	Net Revenues excl. Carbon, US$	Carbon validation, monitoring and certification costs, US$	Carbon Revenues, US$	Net revenues, including carbon, US$
0	752,520	0	-752,520	120,000	0	-872,520
1	752,520	0	-752,520	10,000	0	-762,520
2	752,520	0	-752,520	10,000	0	-762,520
3	752,520	0	-752,520	10,000	0	-762,520
4	793,600	430,169	-363,431	10,000	0	-373,431
5	793,600	430,169	-363,431	55,000	614,654	196,223
6	834,680	430,169	-404,511	10,000	0	-414,511
7	888,880	430,169	-458,711	10,000	0	-468,711
8	929,960	860,338	-69,622	10,000	0	-79,622
9	929,960	860,338	-69,622	10,000	0	-79,622
10	929,960	860,338	-69,622	55,000	1,790,065	1,665,444
11	929,960	860,338	-69,622	10,000	0	-79,622
12	929,960	1,749,292	819,332	10,000	0	809,332
13	929,960	1,749,292	819,332	10,000	0	809,332
14	929,960	1,749,292	819,332	10,000	0	809,332
15	207,440	1,749,292	1,541,852	55,000	1,840,098	3,326,949
16	207,440	1,749,292	1,541,852	10,000	0	1,531,852
17	207,440	1,749,292	1,541,852	10,000	0	1,531,852
18	207,440	1,749,292	1,541,852	10,000	0	1,531,852
19	166,360	1,319,122	1,152,762	10,000	0	1,142,762
20	166,360	1,319,122	1,152,762	55,000	664,687	1,762,449
21	125,280	1,319,122	1,193,842	10,000	0	1,183,842
22	125,280	1,319,122	1,193,842	10,000	0	1,183,842
23	84,200	888,953	804,753	10,000	0	794,753
24	84,200	888,953	804,753	10,000	0	794,753
25	84,200	888,953	804,753	55,000	0	749,753
26	84,200	2,463,953	2,379,753	10,000	0	2,369,753
Total	14,580,400	27,814,373	13,233,973	605,000	4,909,504	17,538,477

Based on the cash flow, we have:

IRR-without carbon	8.8%
IRR- with carbon	14.3%