01 Eligibility

Name of the Project	CARBON SEQUESTRATION THROUGH REFORESTATION AND IMPROVED LAND USE IN THE BOLIVIAN TROPICS BY SMALLHOLDERS - ArBolivia Project
Version of the Standard	CarbonFix Standard v3.1

1. A description of the historical and the current situation of the project area must be given for the last 50 years. This description must include the development of its socioeconomic situation, its changes in land-uses and changes of property rights.

The ArBolivia project is being implemented in settler areas in the Cochabamba Tropics, the Province of Ichilo in the department of Santa Cruz, Northern La Paz, and Western Beni. The settlers' areas have been a destination for migrants coming from the "High Valley" and Altiplano regions of Bolivia since the 1930s. This migration has intensified during the last decades due to increased poverty, the "coca boom" and deterioration of the mining and agricultural economic bases that have traditionally supported the people of the Bolivian highlands.

Dep. Beni	Dep. La Paz	Dep. Cochabamba	Dep. Santa Cruz
Reyes	Ixiamas	Chimoré	Buena Vista
Rurrenabaque	San Buenaventura	Entre Rios	San Carlos
San Borja		Puerto Villarroel	San Juan
		Shinahota	Yapacani

Table I.1 Departments and municipalities were the project is implemented – source: 01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf page 7

Small holders own 95% of the land in the portfolio regions. The sizes of the properties vary, but they are on average 20 hectares per family in the Cochabamba Tropics, and 25 to 50 ha in the other regions. Only a few farmers have land less than 20 ha. The settlers are organized into syndicates of 20 to 60 farmer families. Approximately 5 syndicates form a "central", which in turn belongs to a federation.

The recent migrants have tried to apply traditional land-use practices from their native regions, which are not suitable for the new tropical setting where soils, climate and pests are totally different. Unsustainable land-use practices and associated over-harvesting of native forests has led to widespread deforestation, causing substantial emissions of greenhouse gases. Moreover, it has led to a growing shortage of timber from commercial native species, causing an increase in operating costs in the timber processing industry due to longer supply lines for trunks from remaining primary forests. This has spurred interest by small farmers in the conservation and sustainable management of the primary and secondary forests and in planting trees on their farmland.

Slash-and-burn system

According to studies carried out in the settler areas within the project zones rice cultivation rapidly degrades the soil. For this reason the soils are left fallow for several years (4-7). As a consequence farmers need to look for new soils for rice production, which is achieved by slashing and burning and in this way the agricultural frontier advances. This production method is very inefficient and destructive.

Mechanized rice cultivation

Some rice-cultivation is more intensive. It is mechanised, and fertilisers are also used. Although the

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harvests are higher and rice can be produced almost every year the financial input is also high. After having produced rice over 15 to 20 years (depending on soil conditions), the financial return becomes less than the financial input and the land is then left as wasteland. However since these lands are degraded no natural forest recovery can be expected.

Cattle ranching

Another important land use type in the area is cattle breeding. Cattle often act as a "savings account" for the families. In the project areas cattle's farming is also a relative labour intensive type of production. The ratio of animals to land is two cows per hectare.

Actual Land cover type	Surface (Ha)	Surface (%)
Primary forest	961,160	53.9
Secondary vegetation/fallow	295,019	16.6
Crops	328,223	18.4
Pasture land	134,806	7.6
Water	62,535	3.5
Total	1,781,742	100.0

Table I.2: Land cover in the entire municipalities were the project is implemented - – source: 01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf page 14

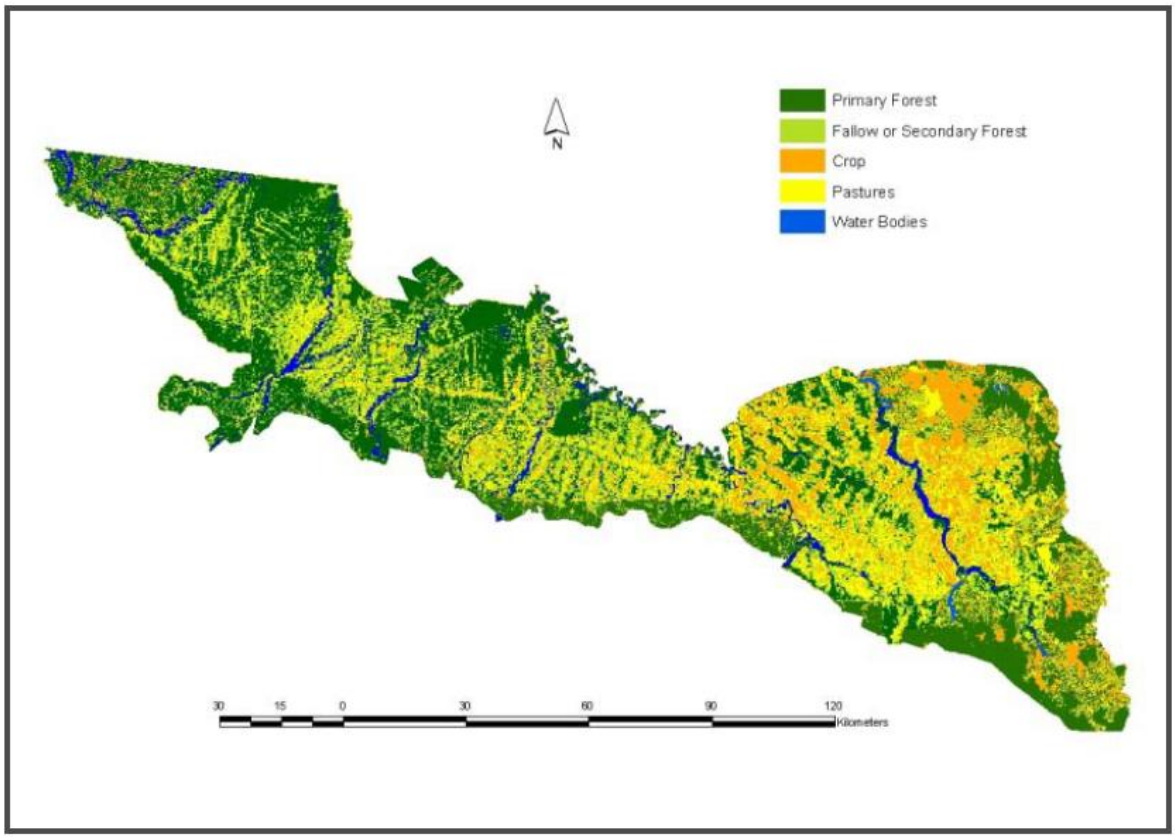


Figure 1.1 Land cover in Cochabamba and Santa Cruz Department – source: 01-10

1. A description of the historical and the current situation of the project area must be given for the last 50 years. This description must include the development of its socioeconomic situation, its changes in land-uses and changes of property rights.

pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf page 14

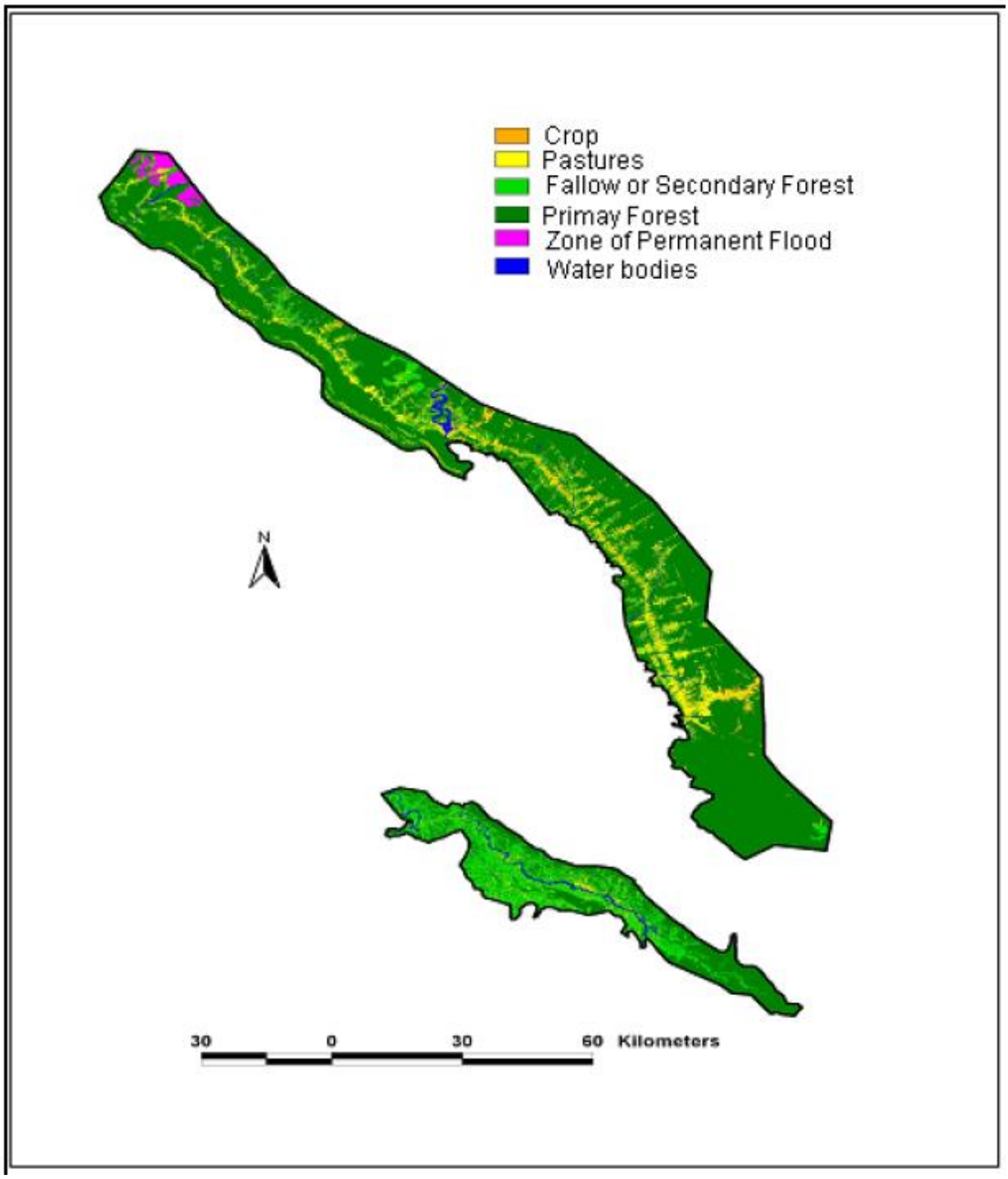


Figure I.2 Land cover in La Paz and Beni Department - – source: 01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf page 14

2. Planting area is ONLY eligible, if the land: a. is not a forest at the date of the project start AND b. will result in the creation of a forest AND c. has not been forest within 10 years prior to the project start OR has been forest within 10 years prior to the project start and evidence is given that absolutely no relation between the project participants and the cause of deforestation exists (e.g. that the forest destruction was caused by force majeure) Criterion 2.c. must be proven by the interpretation of satellite images, aerial photographs, official maps or land-use records.	
a.	Planting area are either areas of fallows, pastures, agricultural and perennial crops. No area classified as forest will be part of the planting area.
b.	Reforestation will result in creation of a forest: In Bolivia the DNA has defined forests as land which has: • A minimum area of 0.5 hectare • A minimum tree crown cover of 30 % • Trees that potentially reach a height of >4 m. All planting areas fulfill these minimum requirements in spatial extent and the forestry plantations will exceed the minimum level of tree cover and height. See also pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf page 21 - 6.1.3.1 Land Eligibility, considering forest-definitions1
c.	see source: "01-09 elegibilidad Rurre TC.pdf", "01-08 elegibility Yapacani.pdf",online http://www.arbolivia.org/index.php?mc=24 and also attachments 01-01 to 01-07

3. Planting area is NOT eligible, if the land a. was deforested to generate CO_2-certificates OR b. is wetland OR c. is situated on ground that is permafrost OR d. is agriculture farming land and threatens through the conversion to forest the food security of the local population.	
a.	Deforestation was done always more than 10 often more than 20 years ago during agricultural expansion without any consideration or intention of generating CO_2-certificates.
b.	No wetlands are included in the planting areas, as they are all designated as strict nature conservation area if part of the wider project area.
c.	No permafrost is present in the project area.
d.	Areas reforested represent only small portions of the holdings of farmers which they designate voluntarily for this purpose in consideration of their food security and livelihood needs. Special programs like Integrated Land Use Planning, Agroforestry systems and silvopastoral systems accompany the project in order to guarantee food and income security for the farmers involved. The project specifically aims at raising food and income security in the project area.

4. Evidence must be given, that in case any agricultural or silvopasture activities are taking place on the project area, they contribute to the aim of creating a forest.

4. Evidence must be given, that in case any agricultural or silvopasture activities are taking place on the project area, they contribute to the aim of creating a forest.
To avoid leakage, in part of the project area improved agricultural, silvopastoral and agroforestry systems will be introduced. Improving productivity of grazing land for cattle production lightens the income losses for cattle ranchers due to their in-kind investment of land for reforestation and reduces the motivation for leakage into areas of primary and secondary forests. All activities have the overall aim to set up a forest.

5. Evidence must be given that no project activities will lead to a long-term increase of green-house-gas emissions of the carbon pool 'soil' on the project area.	
Irrigation	Not taking place
Drainage	Not taking place
Ploughing	Not taking place
Forest operations	Sites will be prepared to enhance the early growth and development of the planted seedlings. The area around the planting spots will be weed free before planting. Planting holes of 20 cm deep and 20 cm wide on cropland and 35 cm deep and 30 cm wide on pasture land will be dug. CO_2 emissions will not be significant due to the **low soil disturbance** caused by this form of site preparation.

6. Evidence must be given that litter (leaves and small branches) is not extracted from the eligible planting area.
Litter will not be extracted from the eligible planting area.

03 Forest Management

Name of the Project	CARBON SEQUESTRATION THROUGH REFORESTATION AND IMPROVED LAND USE IN THE BOLIVIAN TROPICS BY SMALLHOLDERS - ArBolivia Project
Version of the Standard	CarbonFix Standard v3.1

1. A description of the project's silvicultural objectives must be given.
ArBolivia is an alternative business initiative to promote reforestation and economic development of small farmer families. The initiative seeks practical solutions to worldwide deforestation, climate change, and poverty in developing countries. The current focus is on reforestation but during the second half of 2011 it will be widened to include conservation and restoration of existing forests and to address forest degradation. ArBolivia will reforest 6,000 hectares in the sub-tropical lowlands of the Amazon Basin in Bolivia through small-scale forestry plantations with local farm families, using almost entirely native tree species. Since reforestation activities cannot be seen in isolation from other livelihood activities, all project activities are embedded in a proper land use planning system; project intervention begins in all cases with the elaboration of an Integrated Land Use Plan. The ArBolivia Project together with local rural smallholders promotes rural and productive development through reforestation activities with mixed, mainly native tree species, sustainable forestry plantation management and the provision of environmental services that generate economic resources and equal benefits for all stakeholders. Specific silvicultural and forest management task will be defined together with the farmer. The forest plantations will be harvested in the future, but a forest management system will be adopted to minimise CO_2 emissions (by minimising clear-cutting) therewith maximising carbon sequestration. The application of a poly-cyclic harvesting system will guarantee a relatively high average carbon storing capacity in the plantations. Integrated farm planning aimed at improved and sustainable land use with a total participation of 2000 smallholders • On-farm establishment of 5,000 has of small scale mixed native species forestry plantations • On-farm establishment of 1,000 hectares of agroforestry or silvopastoral plantations • Production of a continuous flow of export quality hardwood timber and improved market access • Livelihood improvement through incomes generated from the sale of plantation timber under fair trade conditions. (see "01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf", PlanVivo PDD p. 6) Additional to this within the Integrated farm planning specific conservation areas are defined. The objective of the 5,000 has of small scale native species forestry plantations is to produce quality hardwood timber. To meet this objective an outline of the main steps in field implementation and the technical support provided by project staff could be found in "01-10

pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf", PlanVivo PDD 56ff.

Also an Economic incentive system have been set up:
"As stated in 6.1.2 a contract is signed between the AACS and the farmers. In this contract, the farmer and AACS agree on the conditions for the establishment and maintenance of the plantations. This includes the economic incentive system which works as follows:

The implementation as well as the maintenance activities necessary to ensure optimal tree development within plantations will be carried out by the farmers. The activities, e.g. weeding or pruning, are planned together with the project staff during the farm visits. Activities, planned between farmer and project staff, are noted on an activity planning sheet. During the visit a personalized on-farm capacity building assessment will be realized by the technician to the farmer in order to assure accomplishment according to certain minimal technical standards. Having completed the planned activities according to the completed time schedule, the technician will carry out a further visit in order to carry out an on-farm evaluation of the plantation. If the plantation meets the requirements as established in the standard operational procedures of ArBolivia9, which will guarantee the optimal tree development; payments will be paid in cash to the farmer. Frequency and amount of payment can be found in section G-2" see also 01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf", PlanVivo PDD 23

2. Evidence must be given that the borders of the project area, planting area (eligible and non-eligible), management units and nature conservation area are clearly defined and visible in the field.

All activities are embedded within a comprehensive land use planning system. If land use can be improved, agriculture will become more efficient and the deforestation due to traditional slash and burn methods can be reduced. In addition specific land use will be officially registered and specific areas will be registered as protected areas. The proposed activity contributes to sustainable development by introducing an Integrated Land Use system which seeks to improve the efficiency of land use practices over the entire farm, whilst also taking into account the current and future needs of the farmer family. Sustainable crop and timber production will generate income in the short, mid, and long term. (see "06-07 ArBolvia PlanoVivo_TechSpecs.pdf" PlanVivo Technical Specifications p. 26ff).
Most of all it is important to demarcate the position and the exact surface of the parcel; this is done using GPS and maps of the property. Once these criteria are confirmed, the plantation design is completed and the quantities of planting material to be sent to the plantation are determined.
The geographical coordinates of the boundaries of each of the sites where project intervention will take place (project sites) will be and have been determined by GPS (Positional accuracy 10 m). All parcels have a unique identification code, generated automatically by the database system of the project. Examples of coordinates in UTM-WGS84 of the different parcels where small-scale A/R CDM project activity will take place are shown in table III.1 below. The complete set of data is available on request (see "01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf", PlanVivo PDD p. 10).

Planting areas in the ArBolivia project	Unique ID of planting areas	Easting	Northing
1	SCZ-ICH-SCS-MAT-12-S1-P1	406452	8061405
		406387	8061406
		406353	8061401
		406362	8061308
		406461	8061307
		406450	8061406
2	SCZ-ICH-SCS-14S-27-S1-P1	410632	8104147
		410421	8104211
		410418	8104193
		410625	8104130
3	SCZ-ICH-SCS-14S-27-S1-P2	410765	8104319
		410462	8104405
		410474	8104426
		410772	8104339

Table III.1 Example of coordinates for planting areas

Planting areas in the ArBolivia project	Unique ID of Planting Areas	Municipality	Community	Name/Surname	Status of land ownership	Surface (has)	Actual land use
1	SCZ-ICH-SCS-14S-27-S1-P1	San Carlos	14 DE SEPTIEMBRE	Crispin Miranda Arancibia	Título en Trámite	0,5	Annual crops/fallow land
2	SCZ-ICH-SCS-14S-27-S1-P2	San Carlos	14 DE SEPTIEMBRE	Crispin Miranda Arancibia	Título en Trámite	0,5	Annual crops/fallow land
3	SCZ-ICH-SCS-14S-27-S1-P3	San Carlos	14 DE SEPTIEMBRE	Crispin Miranda Arancibia	Título en Trámite	0,5	Annual crops/fallow land
4	SCZ-ICH-SCS-14S-27-S1-P4	San Carlos	14 DE SEPTIEMBRE	Crispin Miranda Arancibia	Título en Trámite	0,8	Annual crops/fallow land
5	SCZ-ICH-SCS-14S-27-S3-P7	San Carlos	14 DE SEPTIEMBRE	Crispin Miranda Arancibia	Título en Trámite	0,5	Annual crops/fallow land
6	SCZ-ICH-SCS-14S-27-S4-P6	San Carlos	14 DE SEPTIEMBRE	Crispin Miranda Arancibia	Título en Trámite	0,2	Annual crops/fallow land
7	SCZ-ICH-SCS-14S-27-S5-P5	San Carlos	14 DE SEPTIEMBRE	Crispin Miranda Arancibia	Título en Trámite	0,3	Annual crops/fallow land
8	SCZ-ICH-SCS-MAT-12-S1-P1	San Carlos	Mataracu	Antonio Aguilar Cruz	Título en Trámite	1	Annual crops/fallow land
9	SCZ-ICH-SCS-MAT-12-S2-P2	San Carlos	Mataracu	Antonio Aguilar Cruz	Título en Trámite	1	Annual crops/fallow land

Table III.2 Database includes ID of planting area, farmer´s name and residence, status of land ownership, surface, land use before planting and other information.

Figure III.1 The online databse of ArBoliva (http://www.arbolivia.org/) has all contracted farmers, their lands and eligible planting areas clearly defined and visible in the field.

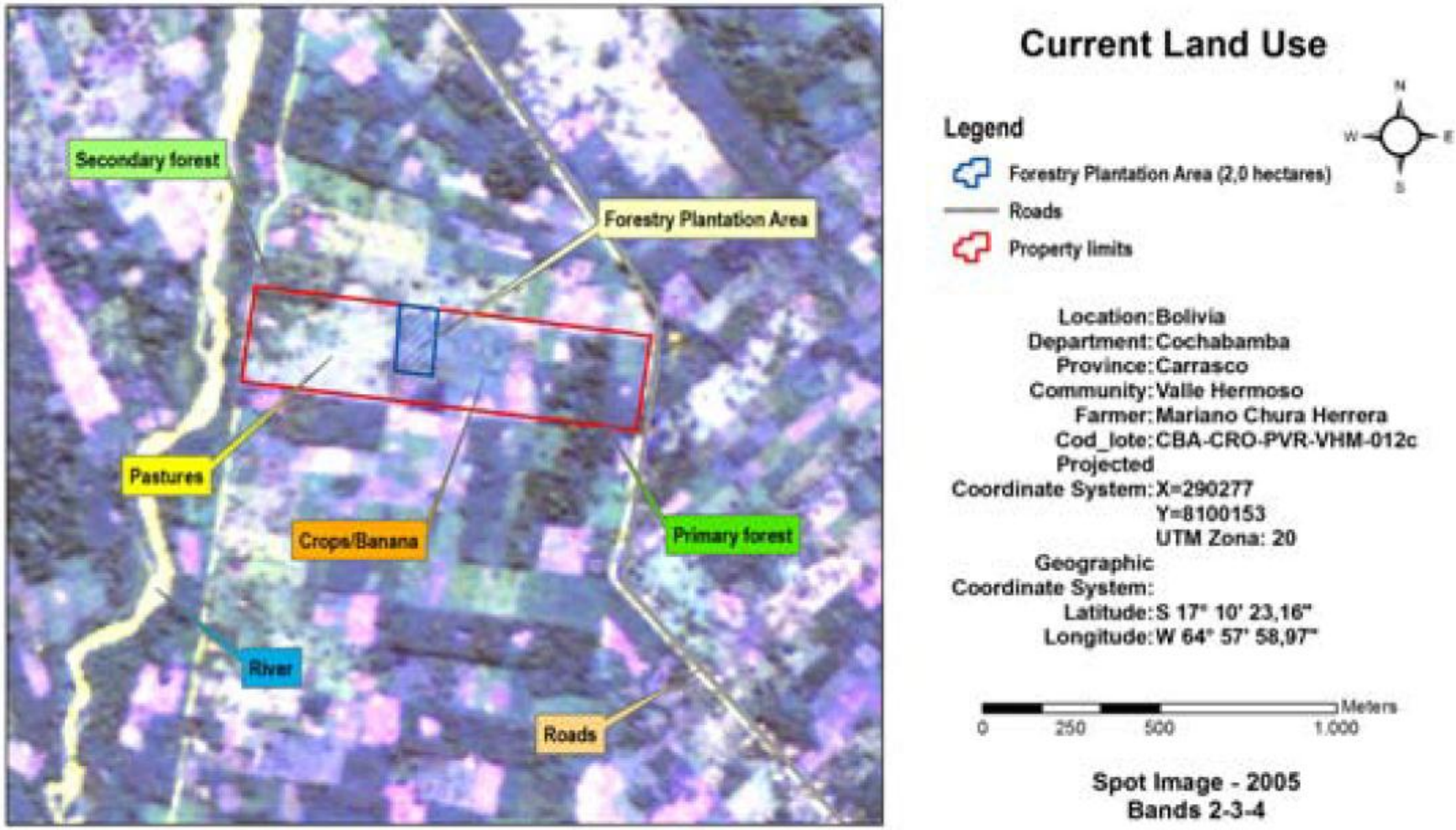


Figure III.2 Detailed mapping of land use and eligible planting area is also available.

3. A description of the following tree species characteristics must be given:
   a. Origin and distribution of the tree species (indicate whether the species are native or not)
   b. Provenance of the seeds
   c. Main purpose / use of trees
   d. Possible pests and diseases
   e. Expected time when forest products are used

	Name If no name given before scientific name, no English name was available.	**Origin and distribution**	**Native?**	**Provenance**	**Main purpose / Use of trees**	**Possible pests and diseases**	**Time of use**
1	*Aspidosperma macrocarpon*, Jichituriqui	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	fungi	25 years (15 – 30 years)
2	*Buchenavia oxycarpa*, Verdolago negro or Pepa	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	-	35 years (> 30 years)
3	*Calophyllum basiliense*, Palo María	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	Insects (e.g. ants & borer)	25 years (15 – 30 years)
4	*Centrolobium tomentosum*, Tejeyeque	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	Insects (e.g. ants & borer)	25 years (15 – 30 years)
5	*Dipteryx odorata*, Almendrillo	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	Insects (e.g. ants)	35 years (> 30 years)
6	*Guarea rusby*, Trompillo de altura	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	Insects (e.g. ants & borer)	22 years (15 – 30 years)

3. A description of the following tree species characteristics must be given:
   a. Origin and distribution of the tree species (indicate whether the species are native or not)
   b. Provenance of the seeds
   c. Main purpose / use of trees
   d. Possible pests and diseases
   e. Expected time when forest products are used

	Name If no name given before scientific name, no English name was available.	**Origin and distribution**	**Native?**	**Provenance**	**Main purpose / Use of trees**	**Possible pests and diseases**	**Time of use**
7	*Schyzolobium amazonicum*, Serebo	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	Insects (e.g. borer)	13 years (10-15 years)
8	*Stryphnodendron purpureum*, Palo yugo	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	-	13 years (10-15 years)
9	*Tapirira guianensis*, Palo román	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	Defoliation by leafcutter ants, wood infection by termites and followed by fungi	22 years (15 – 30 years)
10	*Terminalia amazonica*, Verdolago negro (de ala)	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	Defoliation by leafcutter ants, wood infection by termites and followed by fungi	30 years (> 30 years)
11	*Terminalia oblonga*, Verdolago amarrillo de ala	Neotropical	Yes	Bolivia	Timber / Carbon sequestration	Defoliation by leafcutter ants, wood infection by termites and followed by fungi	35 years (> 30 years)
12	*Virola flexuasa*,	Neotropical	Yes	Bolivia	Timber / Carbon	Defoliation by leafcutter ants,	25 years

3. A description of the following tree species characteristics must be given:
   a. Origin and distribution of the tree species (indicate whether the species are native or not)
   b. Provenance of the seeds
   c. Main purpose / use of trees
   d. Possible pests and diseases
   e. Expected time when forest products are used

	Name If no name given before scientific name, no English name was available.	**Origin and distribution**	**Native?**	**Provenance**	**Main purpose / Use of trees**	**Possible pests and diseases**	**Time of use**
	Gabún				sequestration	wood infection by termites and followed by fungi	
13	Teak, *Tectona grandis*, Teca	Paleotropical, naturalized to Neotropics	No	Bolivia	Timber / Carbon sequestration	Defoliation by leafcutter ants, wood infection by termites and followed by fungi	25 years

4. Evidence must be given that at least 10% of the project area is managed
   a. as a nature conservation area OR
   b. to meet a national or sub-national HCV area definition.

   This criterion must not be fulfilled in case the project consists of more than 30% conservation forest.

Activities are embedded in a proper land-use planning system. If land use can be improved, agriculture can be more efficient, and deforestation due to the traditional way of slash and burn can be reduced. But also more specific land units which will be protected can be defined.

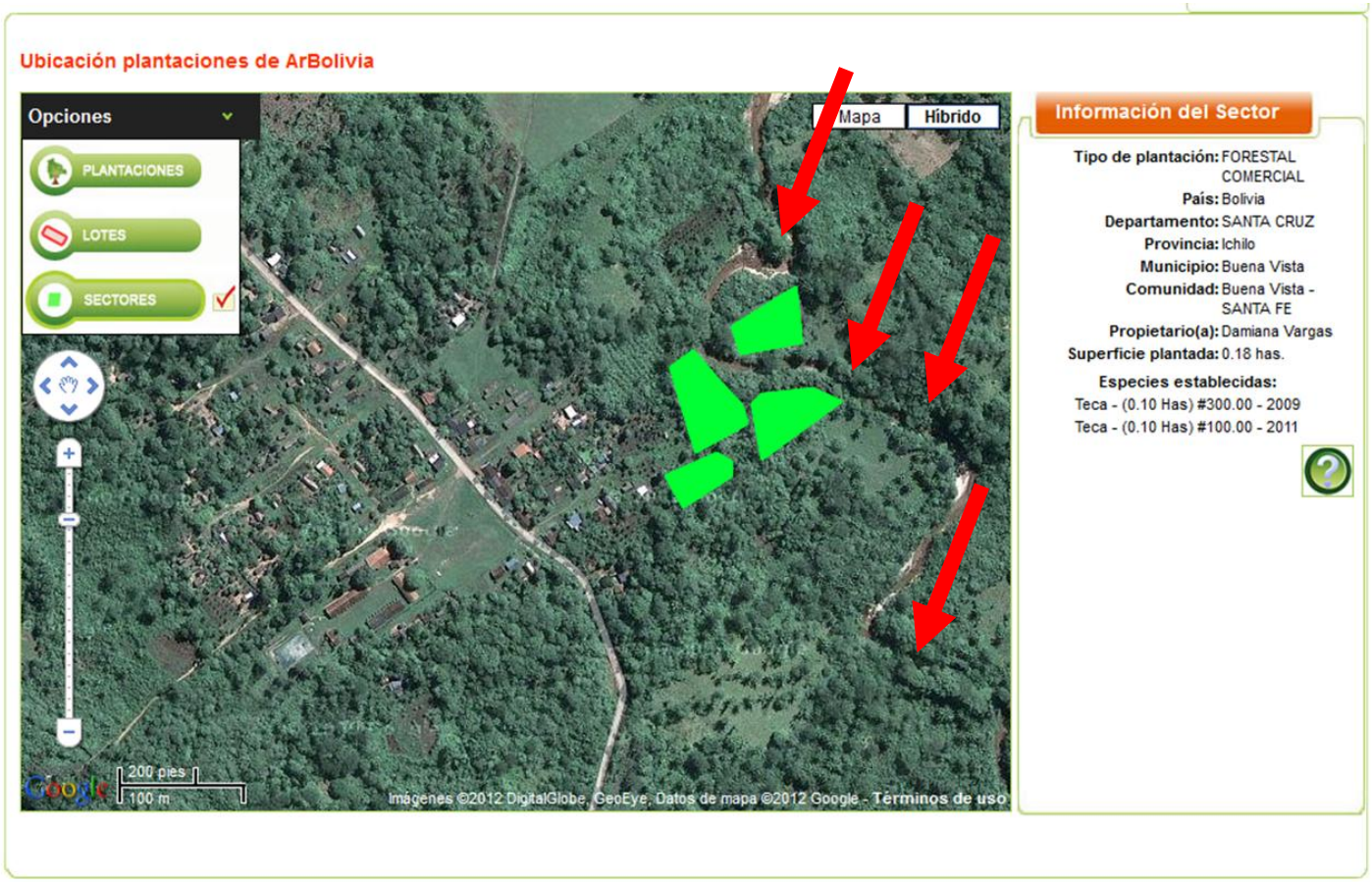
Land-use plans are elaborated with the use of the field forms, these field forms + the mapping of the area is the so called “integrated land-use planning”; future land use is defined here. Major land-use planning, in other words, the most intensive land use possible in the different sectors considering biophysical criteria, is defined in a ‘Plan de Ordenamiento Predial’ (POP).

Based on this the farmer can improve its land use. Since there will be planted only on sites which are in process of degradation and potential future production, the agricultural production can be absorbed easily by the introduced fruit crops and the improved land use, this avoids leakage and reduces de

4. Evidence must be given that at least 10% of the project area is managed a. as a nature conservation area OR b. to meet a national or sub-national HCV area definition. This criterion must not be fulfilled in case the project consists of more than 30% conservation forest.
risk of further deforestation. Since the basic criteria set by the Carbon Fix Standard is sustainable forest management, and the projects provides tools to the farmer to improve their land use and thus avoid deforestation, the benefits of the project for conservation of biodiversity is much higher than just a 10% conservation area. Important to mention in this context, that a biodiversity monitoring system is in place. The ArBolivia is aiming on permanent and visible conservation areas, in the nearby future, of at least 20% of the planted area. Therefor it has developed two strategies. Both are in process of implementation: 1. Conservation of nature on farmland of participating farmers, areas are defined in the POP 2. Conservation of nature on communal land our land of municipalities *1. Conservation of nature on farmland of participating farmers* The establishment of such a conservation area is part of the project design; this is established in the contracts signed between the project and the farmers. *….Asimismo, mediante la planificación integral de la finca y la elaboración de un plan de ordenamiento predial, proponer el mejor uso del suelo y la delimitación de un área de protección permanente, apoyando la conservación de la productividad, la conservación de suelos y la protección de la biodiversidad del lote o parcela. (article 2.1 of farmers contract)* Most farmers choose to protect vulnerable parts of their farm as riversides and other water bodies. (See example below in Santa Fé de Amboro).

4. Evidence must be given that at least 10% of the project area is managed
   a. as a nature conservation area OR
   b. to meet a national or sub-national HCV area definition.

   This criterion must not be fulfilled in case the project consists of more than 30% conservation forest.



4. Evidence must be given that at least 10% of the project area is managed a. as a nature conservation area OR b. to meet a national or sub-national HCV area definition. This criterion must not be fulfilled in case the project consists of more than 30% conservation forest.
2. Conservation areas on communal land of municipalities ArBolivia is supporting, the creation and consolidation of a Municipal Conservation Area of 1,261 hectares with the community Antofagasta, in the municipality of San Carlos. The municipality asked for this support since it didn´t have enough technical, financial and human resources to reach permanent protection of the conservation value of this area. A map of the area is shown below.

4. Evidence must be given that at least 10% of the project area is managed
   a. as a nature conservation area OR
   b. to meet a national or sub-national HCV area definition.

   This criterion must not be fulfilled in case the project consists of more than 30% conservation forest.

Proyecto ArBolivia & Gobierno Autónomo Municipal de San Carlos

Mapa de Ubicación Reserva Municipal "EL CURICHI" Prov: Ichilo Depto: Santa Cruz

Coordenas UTM "Reserva El Curichi"

ID	X	Y
1	415221	8107389
2	414895	8106278
3	414396	8106436
4	414365	8106312
5	412840	8106633
6	413158	8107657
7	412804	8107749
8	413144	8108812
9	412612	8108960
10	414850	8111238
11	416141	8110799
12	415491	8108440

5. Evidence must be given that the nature conservation area is protected or managed in order to establish or re-establish the natural ecosystem of the landscape the project is integrated in.
1. Conservation of nature on farmland of participating farmers Primary and secondary forests will be managed as "Sustainable Nature Reserve", where only sustainable harvest of Non-Timber Forest Products will be allowed. In those cases the forest is degraded enrichment planting is done. Besides protection management is done to make sure pests and fires do not endanger the forests. Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps. See attachment “01-07 Map sample_online_data base.pdf” For the municipal area these and additional activities are developed via ArBolivia´s implementing agency Sicirec Bolivia ltda in: • Site selection and zoning to define the restoration of degraded forests • Restoration of degraded areas by tree-planting • Field inspections, and support to improve the delineation of the area with surrounding communities • Meetings with surrounding communities with the purpose of consolidation the area Biodiversity will be monitored regularly. See attachment “03-01 & 03-02 Monitoreo biodiversidad_03_Nova.pdf”.

6. Evidence must be given that the protection or management of the nature conservation area enhances habitat connectivity.
Through the timber plantations primary and secondary forests will be relieved of timber harvesting pressure and over time secondary forests will regenerate to mature forests with increased biodiversity and ecosystem services. Together with the designed mixed native species plantations (see 1.) the project will enhance habitat connectivity with the primary and secondary forests in the “Sustainable Nature Reserves”. Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps. See attachment “01-07 Map sample_online_data base.pdf” See attachment “03-01 & 03-02 Monitoreo biodiversidad_03_Nova.pdf”

7. Key figures on the following parameters must be provided:
   a. Project area
   b. Planting area
   c. Eligible planting area
   d. Nature conservation area
   e. Schedule of planting

   In case the areas are fragmented, a table shall give a clear overview.

a.	Project area	6000 ha
b.	Foreseen planting area	5000 ha
c.	Eligible	100 %
d.	Nature conservation area	1000 ha

Schedule of planting years for the eligible 5000ha:

Year	Surface (ha)
2007	8
2008	277
2009	379
2010	295
2011	147
2012	83
Subtotal established	**1.189**
2013	500
2014	900
2015	900
2016	800
2017	711
Subtotal scheduled	**3.811**
Total	**5.000**

As the planting area is very fragmented, an overview on the planting activities and clustering that comprise the management units could be provided with the Data Base of the ARBolivia project. The standard procedure is the following:
Planning is registered in a data base, as well as the implemented activities and evaluation of the plantation with recommendations: See as well annex 7 of Plan Vivo PDD and annex 3e Plan Vivo PDD or TS Plan Vivo annex 2 and 3 (supporting document 01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a), for the field forms used. Specific management is sector based.

04 Environmental Aspects

Name of the Project	CARBON SEQUESTRATION THROUGH REFORESTATION AND IMPROVED LAND USE IN THE BOLIVIAN TROPICS BY SMALLHOLDERS - ArBolivia Project
Version of the Standard	CarbonFix Standard v3.1

1. A description, including pictures, of the different land-use classes (see chapter '00 Transparency' - Point 3c.) of the project area must be given.

   In case significantly different land-use classes are bordering the project area, they must also be described.

Land in the project area comprises a heterogeneous mix of different land cover and land use types. Trees will mainly be planted on degraded grassland and on cropland which are part of a slash and burn system. Land use type "annual crops/fallow land"; is mainly rice land, which after the rice harvest will be used for a few months more for maize and after that will become fallow land for several years. Since these lands have been part of such a system for a long time, they are becoming very poor and no crop production can be expected for almost 10 years.

Annual crops
Annual crops are generally part of a slash and burn system in which the main crop is rice. After the rice harvest the land will be used for a few months more for maize and after that, will become fallow land for several years. Since these lands have been part of such a system for a long time, they are becoming very poor and no significant crop production can be expected for the next 10 years or so. The fallow period is getting gradually longer over time. In all cases the fallow period is not sufficient to allow the soil to recover and the level of fallow vegetation as well as agricultural production declines, leading to a further degradation of the soil. In a few cases trees are planted on land used for mechanized annual cropping. This type of agriculture can be found in the province of Ichilo. These lands have been used almost continuously for more than a decade and the use of agricultural inputs such as fertilizers and pesticides increased over these years while yield was reported to decrease (Sejas, 2008)[1]. Once the cost of these inputs exceeds the revenues received, farmers simply leave the area as waste land. No natural regeneration is expected since after a few years of fallow the farmer will use the land again for some marginal crop production. Land degradation will continue. Since multi-temporal satellite image analysis show an increase of agricultural land and a decrease in forest land. Pressure on land will continue, resulting in progressive degradation of productive soils.

Perennial crops
The perennial crops are predominantly full grown, low productive banana plantations, or citrus plantations at the end of their rotation, which are expected to show a decline in biomass in future rather than an increase. The changes in carbon stocks are therefore assumed to be zero. Once perennial crops are no longer productive or production is very low, farmers might let their cattle onto the land, resulting in a decline of biomass, or they just leave it for a few years more after which they slash and burn the perennials and use the land for annual crops. In both cases natural regeneration is expected to be zero, since the farmer will continue to use the land for some marginal crop production, contributing further to the degradation of the land.

[1] 04-02 Sejas Bernal Rober, Rodriguez E., Stilma A.A. 2008. *Mechanized agrcicultural production in the Ichilo Province*. Fundación Cetefor. Cochabamba.

1. A description, including pictures, of the different land-use classes (see chapter '00 Transparency' - Point 3c.) of the project area must be given.

   In case significantly different land-use classes are bordering the project area, they must also be described.

Figure IV.1: Perennial crops, e.g. banana plantation.

Grassland and Grassland with trees

In the project areas, the principal cause of degradation of pastures is bad management, which leads to extreme compaction of the soil, giving way to the gradual invasion of native grasses which end up choking and displacing the cultivated foraging species. Bad management can be caused by overgrazing or under grazing. According to Sejas and Espinosa (2007)[2] the management in the zone consists of burning the pastures every 2 to 3 years in order to eliminate ticks and its eggs, and a burning every 4 to 5 years in order to renew and improve the pastures. The productive period of the pastures is generally considered to be about 20 years. Degraded pasture land is used as leisure areas or shelters.

The cause of degradation can be either: overgrazing or under grazing. Overgrazing results in a significant deterioration of production and soil quality. Undergrazing results in **grassland with trees**, since the partially abandoned and degraded grasslands are invariably invaded by shrubs and small trees. In the absence of the project the most likely scenario is that these areas will be rehabilitated for grazing activities through burning, which means a further degradation of the soils and a decrease of biomass stock in time compared with the biomass which can be found currently in this land use type.

[2] 04-03 Sejas Bernal Rober, Espinosa José, 2007, *Cattle production in the pre-Amazon and sub-Andean ecological region,* Fundación Cetefor. Cochabamba.

1. A description, including pictures, of the different land-use classes (see chapter '00 Transparency' - Point 3c.) of the project area must be given.

   In case significantly different land-use classes are bordering the project area, they must also be described.

Figure IV.2: Grassland (in front), Grassland with trees (in middleground with cattle) and forest margin (background).

Primary and secondary forests
Bordering the project areas or included in nature conservation areas are remnant primary and secondary forests.
According to the biogeographical zonation of Bolivia, the Cochabamba Tropics and Ichilo province belong to: Biogeographic province of Acre and Madre de Dios (South West Amazone), Sector biogeographic Amazon Andean foothill.

Forests of the project area in the biogeographic districts Amazon Chapare and Amazon Alto Beni are characterised by the following species: *Aspidosperma rigidum, Astorcaryum murumur, Attalea phalerata, Brosimum acutfolium, B. lactescens, Cariniana estrellensis, Cedrela odorata, Celtis schippi, Cetrolobium ochtryxylum, Clarisia biflora, C.racemosa, Coussapoa ovalifoloa. C. villosa, Erythrina poeppigiana, Guarea macrophylla, Iriartea detoidea, Leonia glycicarpa, Porcelia steinbachii, P. ponderosa, Poulsenia armata, Pourouma cecropiifolia, Protium opacum, Pseudolmedia laevis, P. macrophylla, Ruizodendron ovale, Sloanea guianensis, Socratea exorhiza, Spaattosperma leucanthum, Swietenia macrophylla, Tabebuia serratifolia, Tapura acreana, Terminalia amazonica, T. oblonga, Trichilia pleeana, Thrihis caucana* (Navarra, 2002)[3].

[3] 04-04 Navarro, 2002, *Geografía Ecológica de Bolivia. Vegetación y Ambientes Acuáticos*. Centro de Ecología Simón I. Patiño-Departamento de Difusión. Cochabamba.

1. A description, including pictures, of the different land-use classes (see chapter '00 Transparency' - Point 3c.) of the project area must be given.

   In case significantly different land-use classes are bordering the project area, they must also be described.

Figure IV.3: Primary forest in a nature conservation area of the project.

Environmental impact assessment was done according Bolivian law and regulations and a "ficha ambiental" was prepared according to Bolivian law 1333, see 04-05 FICHAS AMBIENTALES. For details on any environmental impact related question please refer to the Environmental Impact Assessment by an independent registered consultant and ArBolivia's ecosystem impact monitoring system in the "01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf" PlanVivo PDD p. 45 & 48. and 04-06 the field guide MANUAL DEL SISTEMA DE MONITOREO Y EVALUACIÓN – COMPONENTE BIODIVERSIDAD and 04-07 its field guide for the monitoring of biodiversity.

Generally the project's positive environmental impacts where found to vastly outnumber its minor negative impacts and its measures to mitigate those later ones where approved adequate and technically proper.

2. Evidence must be given that the project has net-positive ecological impacts.

Therefore,

a. positive ecological impacts of the projects must be enhanced and
b. negative or potential negative ecological impacts must be mitigated.

Descriptions of the following project characteristics must be given in regard to point 2.a. and 2.b.:

- Soil Nutrients, Erosion
- Water Quality, Quantity
- Biodiversity Flora, Fauna
- Climate Temperatures, Rain

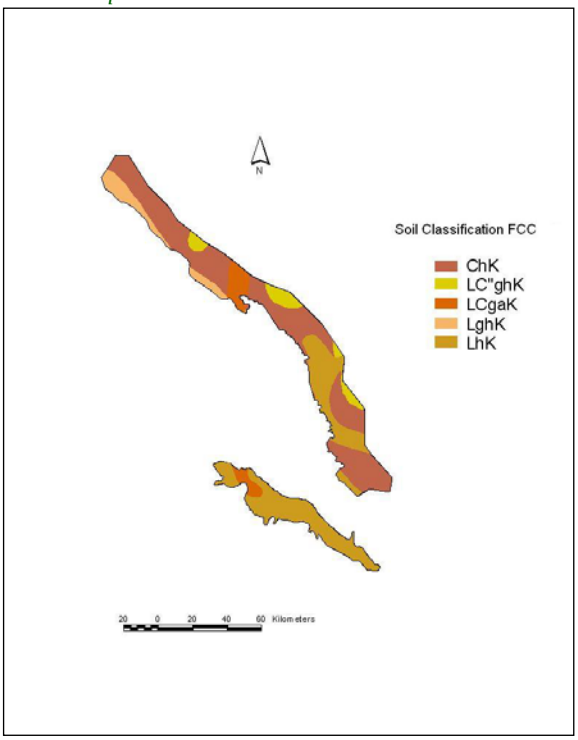
Soil

General

Soil are characterized in different ways, first step has been the characterization based on scientific studies based on the Fertility Capability Classification, since these studies have been done on a relative big scale, field sampling is quantitative and qualitative.

The maps, figure IV-4 and IV-5 delineate soil types using the Fertility Capability Classification (FCC) System. The FCC groups soils according to edaphic criteria that directly influence interactions between nutrient availability and plant growth. A map unit represents the dominant soil type in this unit, which should be the soil type in at least 70% of the area. For the individual tree-planting areas, the scale of this map is not detailed enough, therefore for each individual planting area a soil classification is made, also based on the FCC system, based on these data obtained during site selection a species-site matching assessment is done.

Figure IV-4 Soil map Rurrenabaque area

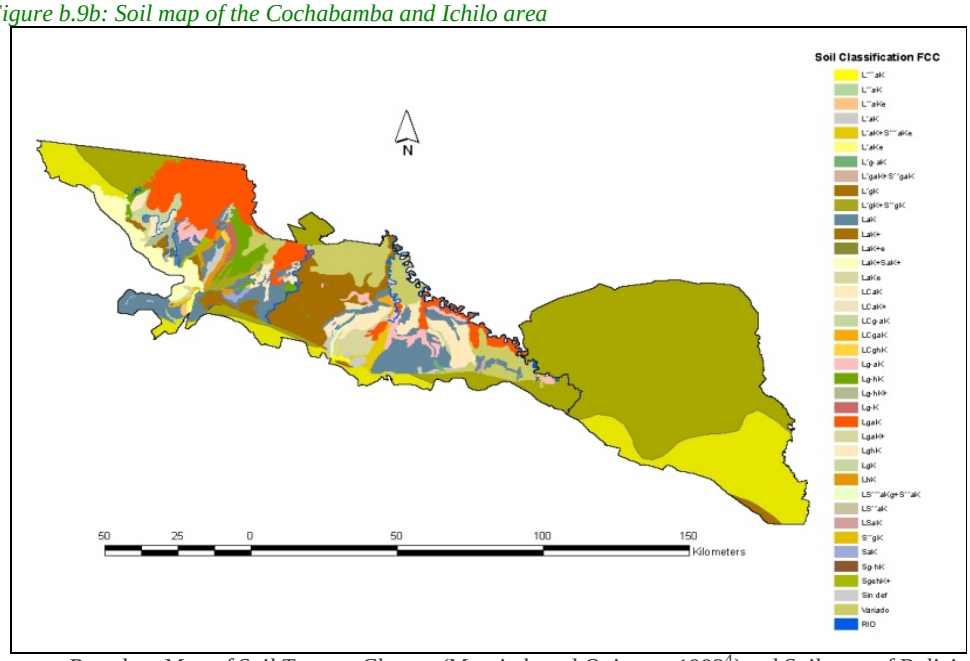


2. Evidence must be given that the project has net-positive ecological impacts.

   Therefore,
   a. positive ecological impacts of the projects must be enhanced and
   b. negative or potential negative ecological impacts must be mitigated.

   Descriptions of the following project characteristics must be given in regard to point 2.a. and 2.b.:
   - Soil Nutrients, Erosion
   - Water Quality, Quantity
   - Biodiversity Flora, Fauna
   - Climate Temperatures, Rain

Figure b.9b: Soil map of the Cochabamba and Ichilo area



Source: Based on Map of Soil Texture Classes (Montieth and Quiroga, 1993[4])and Soil map of Bolivia (ISRIC, 1995[5]) and own field evaluations

In all areas clayey and loamy soils (nomenclature C and L) prevail. Some areas to the north have a greater clay component, while the areas surrounding the central river bed are sandier. The FCC map indicates soil textures but also it indicates the deficiencies present in the soil. Within the area there are a number of factors influencing growth, the main limiting factors are:

- Aluminium toxicity: Within the entire area aluminium toxicity poses a limiting factor for plant growth.
- Gleying: Gleying and poor soil drainage is also a limiting factor in the north-eastern part of the area.
- Low cation exchange: The central area has a low cation exchange capacity.
- Stoniness/ Rockiness: In some areas located along the southern border and along the rivers.

Additional to this in 2008 the Cetefor-foundation carried out a detailed soil study for the different soil types which could be distinguished in the different areas ArBolivia is working. This study included analysis in laboratory of soil samples (see document 04-08 "resultados labaratorio". These data are used to elaborate the documents for Integrated Land Use Planning (POPs). See example 04-09 "Example POP"

Before a decision is taken on the potential suitable species for a specific sector, on

[4] *Monteith,S. and A.Quiroga (1993). Mapeo de Suelos del Chapare con Sistema FCC. Cochabamba, Development-Alt.inc.*
[5] *ISRIC, 1995, Homogenized Soil Data File Global Environmental, International Soil Reference Centre (ISRIC), Wageningen.*

2. Evidence must be given that the project has net-positive ecological impacts. Therefore, a. positive ecological impacts of the projects must be enhanced and b. negative or potential negative ecological impacts must be mitigated. Descriptions of the following project characteristics must be given in regard to point 2.a. and 2.b.: • Soil Nutrients, Erosion • Water Quality, Quantity • Biodiversity Flora, Fauna • Climate Temperatures, Rain	all farms qualitative data gathering for on site and soil characteristics done during the site selection process (see form 6 of the document 04-10 “field forms”. From all sectors were trees are planted qualitative data are available. The different levels of information on soils make it possible to choose those species for a specific site which will reach optimal development of the trees and avoid negative impact on soils and sites. Specie/Site matching is done on such a way that no negative impact should occur on soil fertility; even more tree planting should have positive impact on the soil quality. Impact of the project on environmental aspects including soil fertility will be monitored conform the ecosystem impact monitoring system in the “01-10 PDD_ plan_vivo_arbolivia_with_annexes_110408_a.pdf” PlanVivo PDD p. 45 & 48. and 04-06 the field guide MANUAL DEL SISTEMA DE MONITOREO Y EVALUACIÓN – COMPONENTE BIODIVERSIDAD and 04-07 ”field guide for the monitoring of biodiversity”. **Identified positive aspects:** • Due to better land use planning soil degradation will be reduced by reduced slash-and-burn agriculture. • The tree cover and the management is aiming on soil protection and soil improvement. • Due to litter fall which will not be removed, soil quality will improve. **How will positive aspects be enhanced?** Only native species are used, with the exception of teak which is used on a relative small scale and only if it can be adapted to site conditions, avoiding any negative impact on the site. The strict site selection procedures will avoid negative impacts on site conditions. To increase agricultural production nitrogen fixing soil cover like *Mucuna puriens, Cajanus cajan*, or different varieties of beans will be sown. Preliminary results of ArBolivia´s ecosystem monitoring system: • Indicator on soil compaction: show a decline with forestation. • Soil structure and disturbance: The reforested areas show a decline in soil disturbance. • Soil erosion: The reforested areas clearly show a decline in erosion **Identified negative or potential negative aspects:** Minor negative impacts on soil conditions and water permeability of soils might occur during site preparation just before planting when the ground will be cleaned. **How would you rate the risk?** (x) low ( ) medium ( ) high **How will negative or potential negative aspects be mitigated?** Only native species are used, with the exception of teak which is used on a relative

2. Evidence must be given that the project has net-positive ecological impacts. Therefore, a. positive ecological impacts of the projects must be enhanced and b. negative or potential negative ecological impacts must be mitigated. Descriptions of the following project characteristics must be given in regard to point 2.a. and 2.b.: • Soil Nutrients, Erosion • Water Quality, Quantity • Biodiversity Flora, Fauna • Climate Temperatures, Rain	
	small scale and only if it can be adapted to site conditions, avoiding any negative impact on the site. The strict site selection procedures will avoid negative impacts on site conditions.
Water	**Identified positive aspects:** Hydrographical watershed protection and regulation Regulation of the hydrological cycle, by maintaining the supply of water in the dry season and control against inundations **How will positive aspects be enhanced?** Protection of wetlands and their respective waterside vegetation. • Conservation of water quality, reduction in the sediment and nutrient load, chemical load and salinity • Control against soil erosion and sedimentation • Maintaining the aquatic habitats, by the reduction of water temperature because of the shade of the trees over the rivers and streams, besides the remnants of forest which provide a habitat for aquatic species. Preliminary results of ArBolivia´s ecosystem monitoring system: • Surface runoff: declines with reforestation, the forest works like a sponge • Water infiltration in the soil improves, this can be noticed through improved soil structure • The water balance improves significantly, better water infiltration into the soil, decrease of surface runoff **Identified negative or potential negative aspects:** No negative or potential negative aspects for water and hydrology could be identified, especially as forestry plantation establishment and maintenance is undertaken without chemical pesticides or fertilizers. **How would you rate the risk?** (x) low ( ) medium ( ) high **How will negative or potential negative aspects be mitigated?** No chemical pesticides or fertilizers will be applied in as forestry plantation establishment and maintenance.
Biodiversity	**Identified positive aspects:** It is expected that the reforested areas with native tree species, which at the moment are degraded lands will improve in terms of biodiversity, a higher diversity of species is expected as well as a higher number of individuals per specie. How would you rate the risk? (x) low ( ) medium ( ) high

2. Evidence must be given that the project has net-positive ecological impacts.

   Therefore,
   a. positive ecological impacts of the projects must be enhanced and
   b. negative or potential negative ecological impacts must be mitigated.

   Descriptions of the following project characteristics must be given in regard to point 2.a. and 2.b.:
   - Soil Nutrients, Erosion
   - Water Quality, Quantity
   - Biodiversity Flora, Fauna
   - Climate Temperatures, Rain

	How will positive aspects be enhanced? It is expected that the reforested areas, which at the moment are degraded lands will improve in terms of biodiversity, a higher diversity of species is expected as well as a higher number of individuals per specie. The Simpson's biodiversity index will be used to monitor biodiversity. Only native species are used, with the exception of teak which is used on a relative small scale and only if it can be adapted to site conditions, avoiding any negative impact on the site. The strict site selection procedures will avoid negative impacts on biodiversity. **Identified negative or potential negative aspects:** Minor negative impacts on biodiversity might occur during site preparation just before planting when the ground will be cleaned. Though the flora and fauna in the degraded lands is not rare or endangered but ubiquitous pioneer species. **How would you rate the risk?** (x) low ( ) medium ( ) high **How will negative or potential negative aspects be mitigated?** Only native species are used, with the exception of teak which is used on a relative small scale and only if it can be adapted to site conditions, avoiding any negative impact on the site. The strict site selection procedures will avoid negative impacts on biodiversity.
Climate	**Identified positive aspects:** Carbon sequestration is the main climatic positive aspect of the project. Positive impact on micro-climate by increase in forest cover of the project area and wind breaks are also expected. **How will positive aspects be enhanced?** All forestry plantation management is designed for maximum carbon sequestration and storage of vegetation and soils. **Identified negative or potential negative aspects:** No negative or potential negative aspects for climate could be identified. **How would you rate the risk?** (x) low ( ) medium ( ) high **How will negative or potential negative aspects be mitigated?** The project design is directed at creating positive climate effects only and mitigate climate change.

3. Regarding the biodiversity of a project area, all endangered and critically endangered species of the IUCN Red List must be identified and evidence must be given that appropriate activities are put into place to protect them.

General

Project area is part of the corridor Madidi-Amboro, see map below. (source: http://amboro-madidi.redesma.org/)

Several publication mention the existence of the below mentioned species in the surrounding areas (e.g several publications of SERNAP, and Ibisch et al, 2007. *Visión de la biodiversidad del corridor Amboro Madidi,* Editorial FAN. Santa Cruz de la Sierra). The existence of these species in the remnant forests was confirmed by field agents of ArBolivia as well as farmers. The same studies show that the species mentioned below suffered during the last decades due to a loss of habitat due to deforestation. The tree planting activities will have a positive impact by restoring partly the habitat of these endangered species. A biodiversity monitoring system is designed to monitor the floristic composition and diversity of the plantations as an indicator of improved habitat.

	Name of specie (English, Latin and if possible local language)	**Status** of IUCN Red list	**Activity to protect the specie**
1	Chichilos – Saimiri sciureus	Least Concern	Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps.
2	taitetú - *Tayassu tajacu*	Least Concern	Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps.
3	parabas - *Ara spp*	Critically Endangered	Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps.
4	loro cenizo - *Amazona farinosa*	Threatened Species	Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps.
5	venado o huaso - *Mazama americana*	Data Deficient	Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps.
6	tropero - *Tayassu pecari*	Near Threatened	Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps.
7	anta - *Tapirus terrestris*	Vulnerable A2cde+3cde	Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps.
8	oso hormiguero - *Tamandua tetradactyla*	Least Concern	Project could be seen as a farmers puzzle. Primary forest plots are integrated within this puzzle, thus, the listed species have enough natural habitat. In addition, the afforestation activities will close existing gaps.

See attachment “004-06 and 04-07 ”on monitoring of biodiversity”.

4. Evidence must be given that the use of chemical products is
   a. justified AND
   b. minimized AND
   c. documented

As a general standard Arbolivia doesn´t promote and doesn´t allow the use of chemical pesticides and fertilizers in the plantations. However it is common practice of the small farmers to use pesticides for their crop production. ArBolivia does allow crop production within the plantations, the field agents of ArBolivia have instructions to advice the farmers not to use these chemical products and they are also explaining the disadvantages of the use of chemical products, even more Arbolivia is organizing workshops with farmers to promote the use of bio-pesticides as well the application of mechanical weeding and the advantages of this above chemical weeding. So in general it is expected that the use of chemical products will decline due to the project.

Only in case of extraordinary attacks of leaf-cutters ArBolivia can decide to provide pesticides to farmers, respecting the list of approved hazardous pesticides by FSC.

ArBolivia doesn´t provide any chemical product to the farmers to control weeds.

	Name of product	**Main ingredient**	
1	Mirex-s	Sulfuramida	**Purpose of use?** Control of leaf-cutter (ants) **How is the use minimized?** • Areas with a high risk for attacks of the leaf-cutter are identified. • In these areas only tree-species are planted which have a high resistance against the leaf-cutter. • Prevention measures are taken by applying bio-pesticides and beans are sown between the seedlings as a natural barrier. • If the problem persists and seedlings are completely destroyed by the ants the use of Mirex will be considered. • ArBolivia will continue exploring ant control through the application of bio-pesticides and intercropping so the use of homicides can be reduced to zero. **How is the use documented?** • On delivery by the field agent to the farmer a receipt with the date, quantity, name of product is signed and stored in the farmers file • A form is filled in, once the farmer has got the instruction how to apply the product, this is stored in the farmers file and in the data base • After having applied the product the area will be evaluated, results are filled in on a form and stored in the file and in the data base.
2	NA	NA	**Purpose of use?** - **How is the use minimized?** - **How is the use documented?**

4. Evidence must be given that the use of chemical products is
   a. justified AND
   b. minimized AND
   c. documented

As a general standard Arbolivia doesn´t promote and doesn´t allow the use of chemical pesticides and fertilizers in the plantations. However it is common practice of the small farmers to use pesticides for their crop production. ArBolivia does allow crop production within the plantations, the field agents of ArBolivia have instructions to advice the farmers not to use these chemical products and they are also explaining the disadvantages of the use of chemical products, even more Arbolivia is organizing workshops with farmers to promote the use of bio-pesticides as well the application of mechanical weeding and the advantages of this above chemical weeding. So in general it is expected that the use of chemical products will decline due to the project.

Only in case of extraordinary attacks of leaf-cutters ArBolivia can decide to provide pesticides to farmers, respecting the list of approved hazardous pesticides by FSC.

ArBolivia doesn´t provide any chemical product to the farmers to control weeds.

	Name of product	**Main ingredient**	
			-
3	NA	NA	**Purpose of use?** - **How is the use minimized?** - **How is the use documented?** -

Use of bio chemicals and fertilizer by farmers on their private lands is expected to decline with reforestation. If pests or diseases appear on the forestry plantations, these will be controlled by using organic products and in the worst case scenarios chemical control methods may be used as a last resort but only after careful consideration of the environmental impacts (see PlanVivo PDD p. 58).
Nursery

5. Evidence must be given that waste is disposed of in an environmentally appropriate way.

Amounts of waste created by project activities are expected to be minimal and will always be disposed of in an environmentally appropriate way.

6. Evidence must be given that 15 meter wide buffer strips along permanent or temporary water courses (streams, rivers, wetlands) are implemented. These buffer strips must be
   - part of the nature conservation area, OR
   - must be managed according to '06 CO_2-fixation - Option 1b) Conservation forest'.

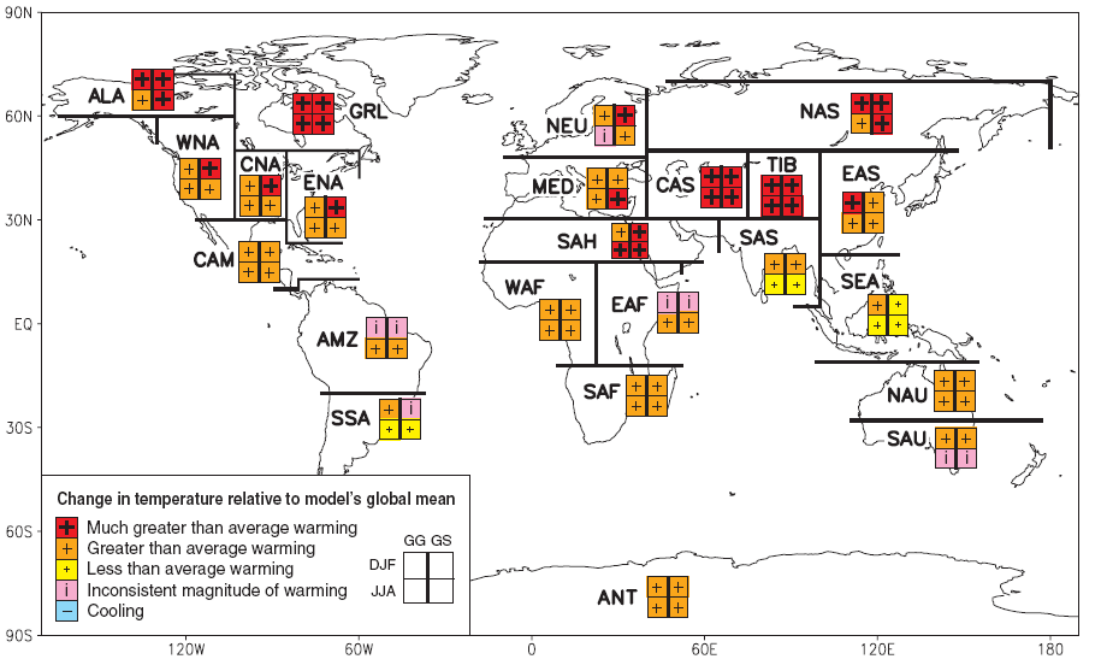
   In both cases only native tree species are allowed to be planted.

Buffer strips are included in nature conservation areas around wetlands, streams and rivers and if any, only native tree species will be planted in them.

7. Evidence must be given that no genetically modified species are being used.
No genetically modified species what so ever will be employed in the project. Only native species are used, with the exception of teak which is used on a relative small scale and only if it can be adapted to site conditions, avoiding any negative impact on the site.

8. Evidence must be given that the project management is planting native species in mixed stands and in case the timber of the forest is being used, selective harvesting management is applied. Otherwise, the project must justify its • choice of tree species • silvicultural system • harvesting method
Only native species are used, with the exception of teak which is used on a relative small scale and only if it can be adapted to site conditions, avoiding any negative impact on the site. The forest plantations will be harvested in the future, but a forest management system will be adopted to minimize CO_2 emissions (by minimizing clear-cutting) and thereby maximizing carbon sequestration. The application of a poly-cyclic harvesting system will guarantee a relatively high average carbon storing capacity in the plantations. Specific procedures for this will be developed in time. A monitoring plan is in place to monitor natural regeneration. For, each specie, different regeneration strategies will be developed based on monitoring. Apart from environmental and biodiversity criteria it will be necessary to consider as well the economic interests of the farmers and investors in this. A polycyclic system might be interesting form a financial point of few, since replanting costs will be low and there will be a more continuous flow of revenues from the plantations. Practices of Reduced-Impact-Logging (RIL) as directional felling will be employed by ArBolivia during harvest and those techniques thought to farmers during capacity building workshops.

9. Evidence must be given that all species planted are site-adapted under changing climate conditions.



Source: www.grida.no/climate/ipcc%5Ftar – Report 'The Scientific Basis' – Chapter 10 – Page 596

The global warming by anthropogenic climate change is not expected to be much greater than average warming for Bolivia. Only native species are used, with the exception of teak which is used on a relative small scale and only if it can be adapted to site conditions. Relevant literature recommends use of native tree species for climate change adaptation as during the course of evolution those species have gone through selection process of hypothermal and or more arid conditions. Especially their larger genetic variety compared to introduced exotic species of a few provenances offers higher chances of breeds able to deal with changed climatic conditions like e.g. higher temperature and lower rainfalls.

05 Socioeconomic Aspects

Name of the Project	CARBON SEQUESTRATION THROUGH REFORESTATION AND IMPROVED LAND USE IN THE BOLIVIAN TROPICS BY SMALLHOLDERS - ArBolivia Project
Version of the Standard	CarbonFix Standard v3.1

1. Evidence must be given that the project has net-positive socio-economic impacts.

   Therefore,
   a. positive socio-economic impacts of the project must be enhanced and
   b. negative or potentially negative socio-economic impacts must be mitigated.

   For point 1.a. descriptions of the following aspects must be given:
   - Creation of employment
   - Capacity building
   - Welfare activities

   For point 1.b. descriptions of the following aspects must be given:
   - Stakeholder involvement from the time the project was planned
   - Displacement of people
   - Spiritual, religious, or other socially important places influenced by the project activities

Creation of employment

	Amount of people (currently)		Amount of people (long-term) (if no changes please delete)	
Management	4	-	4	-
Employees	8,5	-	8,5	-
Contractors	-	4	-	-
Workers	26,5	-	26,5	-
SUM	39	4	39	-

See attachment “05-01 list of employees”

Capacity building

Since the implementation of the project depends largely on the farmers’ input, capacity building and the transfer of technology is extremely important. Training for farmers is focused on technical issues such as planting techniques,

1. Evidence must be given that the project has net-positive socio-economic impacts. Therefore, a. positive socio-economic impacts of the project must be enhanced and b. negative or potentially negative socio-economic impacts must be mitigated. For point 1.a. descriptions of the following aspects must be given: • Creation of employment • Capacity building • Welfare activities For point 1.b. descriptions of the following aspects must be given: • Stakeholder involvement from the time the project was planned • Displacement of people • Spiritual, religious, or other socially important places influenced by the project activities	
	management techniques, protection measures against pests, diseases, floods, fires and other risks which might appear during project life. Capacity building is also focused on farm planning. Training on financial issues, administrative and legal issues is part of the meetings with the forestry committees. The development of workshops on improved access to markets and improving the chain of custody for timber will be done when this is becoming relevant. Since the first thinning's programmed in the second half of 2013, workshops will be held with those farmers and communities where these thinning's will be done. Apart from training in groups it is important to mention that farmers receive on an individual base instructions/training during the field visits of the field agent to the farmer. This starts with the first visit when site selection is done and the farmer participates in the recollection of site data, during this phase of the project the farmer receives information on farm planning. Records of this can be found in each individual file and in the database. (example 05-03)
Welfare activities	Given the multiple tasks that many smallholders carry out on their different livelihood income activities, special interest is given by the project to the communal development of small scale forestry service enterprises. These enterprises will provide services to smallholders by carrying out management tasks for forestry plantations, as well as providing crucial inputs, such as plant material. The objective of local capacity building through small-scale enterprise for forestry services is intended to provide favourable conditions for forestry development, local empowerment and to contribute towards a process of decreasing dependency on project staff.

1. Evidence must be given that the project has net-positive socio-economic impacts. Therefore, a. positive socio-economic impacts of the project must be enhanced and b. negative or potentially negative socio-economic impacts must be mitigated. For point 1.a. descriptions of the following aspects must be given: • Creation of employment • Capacity building • Welfare activities For point 1.b. descriptions of the following aspects must be given: • Stakeholder involvement from the time the project was planned • Displacement of people • Spiritual, religious, or other socially important places influenced by the project activities	
Involvement prior to the project start	The project was developed in conjunction with the participating farmer organisations. Early consultation was reviewed as well by JACO-CDM, during field validation for CDM. See document 05-04 pag A13 and 05-05 pag A14 CCB Standard Checklist). Several studies have been carried out on the feasibility of the project within the ENCOFOR-project (see supporting documents 05-08 Encofor, an EU-funded project for the design of sustainable CDM forestry projects http://www.joanneum.at/encofor/casestudies/Chapare.html) 05-09 *Berger D. Stilma A.A. 2006. Estudio de Prefactibilidad Captura de carbono y apoyo a la conservación a través del manejo sostenible de recursos forestales en la zona de amortiguamiento del PNANMI Madidi y de la RBTCO Pilón Lajas. DED/PRISA/CETEFOR. Rurrenabaque* 05-10 Berger D. 2007. Summary of the livelihood study, realized in colonization areas of the Cochabamba tropics and the areas of influence of the Park Madidi, North of La Paz, and Pilon Lajas, Beni Bolivia. 05-11 Sejas Bernal R, Rodriguez E., Stilma A.A. 2008. *Mechanized agricultural production*. Fundación CETEFOR Cochabamba 05-12 Sejas Bernal R. Espinosa J. 2007. *Cattle production in the pre-Amazon and sub-Andean ecological region. Fundación CETEFOR. Cochabamba* Two pilot projects, financed by the Flemish NGO Groenhart were conducted from 2005 to 2006 by the CETEFOR-foundation, with the objective of validating the efficacy of the proposed activities by obtaining valuable feedback from the farmers. Based on feasibility studies, farmer meetings and these pilot projects the final project was designed.

1. Evidence must be given that the project has net-positive socio-economic impacts. Therefore, a. positive socio-economic impacts of the project must be enhanced and b. negative or potentially negative socio-economic impacts must be mitigated. For point 1.a. descriptions of the following aspects must be given: • Creation of employment • Capacity building • Welfare activities For point 1.b. descriptions of the following aspects must be given: • Stakeholder involvement from the time the project was planned • Displacement of people • Spiritual, religious, or other socially important places influenced by the project activities	
	Involvement of farmers Participation is voluntary and in order to motivate farmers to change their current land use practices different approaches will be applied: 1. Participative approach • Farmers and their organisations have participated in the design of the project; they will also participate in the implementation of the project through the forestry committees. • During the implementation and consolidation phase of the project, farmers and their communities and organisations play an active role through entrepreneurial involvement. Decision-, strategy-, and policymaking are the jurisdiction of forestry committees and project staff. • Communal and/or local organizational laws and regulations, as well as verdicts, are mandatory for the project implementation according to their degree of authority. Therefore agreements with local authorities and farmers organizations are established to agree upon the details under which the project will be implemented under their jurisdiction. • The project will have a high presence in the area, and work closely with the farmers initiating a process of local empowerment through the formed forestry committees. • The specific Integrated Land Use design, the specific site selection for plantations and the plantation design is done on a participatory way. 2. Promotion and education • Implementation of an extension program to create awareness of the advantages of the proposed land use practices among farmers. • Training of farmers to create the necessary knowledge and skills concerning the new land use practices. • Training of community based forestry companies for the fulfilment of certain necessary tasks, such as plant production,

1. Evidence must be given that the project has net-positive socio-economic impacts.

   Therefore,
   a. positive socio-economic impacts of the project must be enhanced and
   b. negative or potentially negative socio-economic impacts must be mitigated.

   For point 1.a. descriptions of the following aspects must be given:
   - Creation of employment
   - Capacity building
   - Welfare activities

   For point 1.b. descriptions of the following aspects must be given:
   - Stakeholder involvement from the time the project was planned
   - Displacement of people
   - Spiritual, religious, or other socially important places influenced by the project activities

	maintenance of the plantations, within the established quality norms and criteria of ArBolivia. (see "01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf" PlanVivo PDD p. 38)
Displacement of people	Not happening by the project. All residents (also not participating ones) are encouraged to stay in the project area and benefit from project activities increasing their livelihoods and land value like forestry plantations, agroforestry projects, small scale communal enterprises, pasture improvement, integrated land use planning etc.
Spiritual, religious, or other socially important places influenced by the project activities	None

2. A stakeholder consultation must take place to give further evidence for the criteria 1.a. and 1.b.

   For this consultation, all stakeholders must be invited
   - using appropriate means of communication AND
   - providing them with sufficient information on the project activities.

   The results of the consultations must be documented.

The project was developed in conjunction with the participating farmer organisations. Early consultation was reviewed as well by JACO-CDM, during field validation for CDM. See document 05-04 pag A13 and 05-05 pag A14 CCB Standard Checklist).				
	Stakeholder	**Means of invitation** Radio (R), Newspaper (N), Letter (L), Posted notice (Pn), Email (E), Fax (F)	**Information supplied to them** CFS, Project description (Pd), ...	**Feedback from stakeholders**
1	Owner of the land	Visits and meetings	Project description, already during planning stage	See supporting document 01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a, section B6.1 especially 6.1.1 and 6.1.2. Agreements with local governments, farmers organizations and forms of each individual site visits (over 1,000) are available, as well as the minutes of the meetings of the forestry committees. Due to the huge amount I suggest that this documentation will be verified during the field validation. Constructive feedback, generally positive, voluntary signing of contracts in majority of cases.
2	Owner of the timber	Visits and meetings	Project description, already during planning stage	Constructive feedback, generally positive, voluntary signing of contracts in majority of cases.
3	Owner of other resources (Honey, Deadwood, etc.)	Visits and meetings	Project description, already during planning stage	Constructive feedback, generally positive, voluntary signing of contracts in majority of cases.
4	Project financier	Meetings, Email, Letter and others	Project description, already during planning stage	Constructive feedback, generally positive
5	Project management	Meetings, Email, Letter and others	Project description, already during planning stage	Constructive feedback, generally positive

2. A stakeholder consultation must take place to give further evidence for the criteria 1.a. and 1.b.

For this consultation, all stakeholders must be invited
- using appropriate means of communication AND
- providing them with sufficient information on the project activities.

The results of the consultations must be documented.

The project was developed in conjunction with the participating farmer organisations. Early consultation was reviewed as well by JACO-CDM, during field validation for CDM. See document 05-04 pag A13 and 05-05 pag A14 CCB Standard Checklist).

	Stakeholder	**Means of invitation** Radio (R), Newspaper (N), Letter (L), Posted notice (Pn), Email (E), Fax (F)	**Information supplied to them** CFS, Project description (Pd), ...	**Feedback from stakeholders**
6	Employees	Meetings, Email, Letter and others	Project description, already during planning stage	Constructive feedback, generally positive
7	Contractors	Meetings, Email, Letter and others	Project description, already during planning stage	Constructive feedback, generally positive
8	Workers	Visits and meetings	Project description, already during planning stage	Constructive feedback, generally positive
9	Forest authority	Meetings, Email, Letter and others	Project description, already during planning stage	Constructive feedback, generally positive
10	National NGOs	Meetings, Email, Letter and others	Project description,	Constructive feedback, generally positive

2. A stakeholder consultation must take place to give further evidence for the criteria 1.a. and 1.b.

For this consultation, all stakeholders must be invited
- using appropriate means of communication AND
- providing them with sufficient information on the project activities.

The results of the consultations must be documented.

The project was developed in conjunction with the participating farmer organisations. Early consultation was reviewed as well by JACO-CDM, during field validation for CDM. See document 05-04 pag A13 and 05-05 pag A14 CCB Standard Checklist).

	Stakeholder	**Means of invitation** Radio (R), Newspaper (N), Letter (L), Posted notice (Pn), Email (E), Fax (F)	**Information supplied to them** CFS, Project description (Pd), ...	**Feedback from stakeholders**
			already during planning stage	
11	Indigenous people	Visits and meetings	Project description, already during planning stage	Constructive feedback, generally positive
12	Communities	Visits and meetings	Project description, already during planning stage	Constructive feedback, generally positive

3. Evidence must be given that first aid kits are reasonably accessible for the working staff.

For employees of the project “ARBolivia” first aid kits are available. Farmers (more than 1000), part of the project, are responsible for their own safety. ARBolivia support the farmers by conducting training to farmers regarding national security standards. Especially forest management actions like pruning will be trained, because they are the source of the main risk.

4. Evidence must be given that the working staff is able to organize themselves and negotiate with their employers on a voluntary basis.
The proposed activity will be executed in settler areas and in indigenous territories in the Cochabamba Tropics, in the Province of Ichilo in the department of Santa Cruz, and in Northern La Paz, and Western Beni, with the aim of reforesting 6000 ha of farm land. The settlers are organised into syndicates of 20 to 60 farmer families. Approximately 5 syndicates form a “Central”, which in turn belongs to a “Federation” (Federación). Social participation is key for the project; therefore the project collaborates as much as possible with farmer’s organisations and local governments. Agreements have been signed with: • Federación de Comunidades Agropecuarias de Rurrenabaque (FECAR –Department of Beni)-2007 • Federación Sindical de productores Agropecuarios de Ituralde (FESPAY – Department of La Paz)-2008 • Municipality of San Carlos (Department of Santa Cruz)-2008 • Municipality of San Juan (Department of Santa Cruz)-2008 • Federación especial de colonizadores de Chimoré (FECH-Department of Cochabamba) -2009 • Federación especial de colonizadores de Carrasco Tropical (FECCT-Department of Cochabamba)-2009 • Federación Sindical de comunidades Interculturales productores agropecuarios Yapacani - Ichilo (FSCIPAY-Department of Santa Cruz) – 2009 • Central Buena Vista • An agreement with the Municipality of Buena Vista (Santa Cruz) is under revision of the municipality. These agreements cover almost all areas in which the project is being implemented, examples of agreements with a municipality and a federation are shown in annex 4c of the PlanVivo PDD see “01-10 pdd_plan_vivo_arbolivia_with_annexes_110408_a.pdf” p. 179. With the indigenous territories other arrangements exist dependent on the specific characteristics of the territory. In the Takana area e.g. on this moment the authority of the indigenous territory CIPTA is giving a casa per case permission for members willing to join the ArBolivia project (see 05-06 Doc Cipta).

5. Evidence must be given that all equipment (tools, machines, etc.) of the working staff are in safe working mode.
All equipment of working staff and handed-out / lent to farmers are in safe working mode and are checked for maintenance regulary.

6. Evidence must be given that proper protective equipment and training of the working staff is enforced - especially when chemicals are used.

6. Evidence must be given that proper protective equipment and training of the working staff is enforced - especially when chemicals are used.
Since the implementation of the project depends largely on the farmers' input, capacity building and the transfer of technology is extremely important. Working safety is an essential component of all capacity building workshops and project activities. For later harvesting all necessary safety precautions will be heeded by trained and specialized project staff. For hazardous work, preferably specialized project staff will be employed with proper protective equipment. Should farmers require any further protective equipment and training during plantation maintenance it will be provided to them. Famers will be frequently visited on their land by extension workers, receiving regular assessments on the implementation, management of their plantations and compliance with project safety regulations.

7. Evidence must be given that no children under the age of 16 are working for the project.
No children under the age of 16 are working for the project in compliance with respective Bolivian labor laws and farmers are instructed not to employ children on the forestry plantations.

8. Evidence must be given that contracts are clearly defined and include the following aspects: **For employees** a. working hours and leave days b. duties c. salary d. modalities on health insurance e. modalities on the termination of the contract **For contractors** a. tasks (quantity, quality, time) b. payment c. modalities on the termination of the contract
In respect to ArBolivia´s project employees all have received contracts in accordance with Bolivian labor laws and regulations. In respect to the farmers who are voluntarily making an in-kind investment with their land and labor force, they are free to choose their rhythm of work in plantation maintenance suiting their livelihood needs on their farms. Fixed dates only exist for planting, which happens on one day to minimize stress on saplings and site visits by project staff extension workers which do not exceed a couple of hours. In the contracts between farmers and AACS no salaries are agreed but regular payments for plantation establishment and maintenance (see PlanVivo PDD Payment Plan p. 55). Both sides can terminate the contract, while AACS will only do this in case of infringements against contract conditions proven e.g. illegal premature harvesting of timber. See also example contract between AACS and farmer in Annex 4b of PlanVivo PDD p. 158ff.

8. Evidence must be given that contracts are clearly defined and include the following aspects:

For employees

a. working hours and leave days
b. duties
c. salary
d. modalities on health insurance
e. modalities on the termination of the contract

For contractors

a. tasks (quantity, quality, time)
b. payment
c. modalities on the termination of the contract

See attachment “05-02 example of contracts.zip”

9. Evidence must be given that working staff from areas close to the project is preferred.

The project employs primarily and preferably Bolivian nationals and locals for all tasks qualified staff can be found for. The main project implementation relies on the local farmers themselves.

10. Evidence must be given that throughout the project activity project stakeholders are able to address their concerns to the management staff.

The aforementioned „Forestry Committees“ constitute the primary formal mechanism for engagement of smallholders in discussion of the project goals and implementation. These committees are established within the pre-existing grassroots political mechanism which defines the smallholder communities, their „sindicato“ (union). Forestry Committees have been formed in some 13 communities, where there is a „quorum“ of project participants present, but the intention is to keep building this structure where possible to facilitate greater participation in the project on a political level of active engagement. The internal regulation document explicitly describes the role of the committees, as well as their constituent parts and operations. Mechanisms for the resolution of conflicts between the project management and smallholders are also described therein. Interviews conducted as part of sampling included meeting active members (i.e. those holding office) within the forestry committees.
An agreement between ArBolivia and a higher-level political entity, a Federación sindical, which unites a number of Centrales, which in turn represent a number of sindicatos, was also provided as supporting evidence of articulation with pre-existing socio-political structures within the smallholder community. Roll-out of the Forestry Committees, and the level of participation they engender, as well as meaningful engagement in terms of project management, resolution of conflicts or disputes, etc., should be monitored going forward, as this is a key mechanism for smallholder participation.

Projects benefits, and the distribution of these benefits, will be monitored and administered by the project in a transparent way. In order to guarantee the fair distribution of benefits, the partner farmers have access to the financial accounts of the project and, through the forestry committees, they are involved in decision making with respect to the development of the chain of custody and the sale of the products of the forestry plantation.

10. Evidence must be given that throughout the project activity project stakeholders are able to address their concerns to the management staff.
Farmers are regularly visited by project staff extension workers and members of the forest committees. During all consultations and workshops of the project every stakeholder was free to voice their opinion and objections about the process and continuously encouraged to do so. All components of ArBolivia, like Sicirec Bolivia Ltd., AACS, the forest committees, the farmers and indigenous federations and syndicates as well as the individual farmers themselves are involved in a continuous communication process to elaborate and improve where possible the common effort. Please see also the regulations of the Forestry Committees in PlanVivo PDD Annex 9b p. 254. Also see section C p. 25 and section D p. 30 – PlanVivo PDD The forestry committees play an important role for participating farmers to raise their concerns, farmers can raise their concern in the meeting and will be answered in the same meeting or if some analysis of the management is needed a date for responding will agreed. Of this meeting official minutes are made (for an example see doc. 05-07 Libro de Actas Santa Fé). Farmers can express their concerns as well by writing a letter, which can by a letter of the management or in a meeting of the forestry committee.

11. Evidence must be given that throughout the project activity any concerns by project stakeholders are documented and appropriately responded to by the management staff.
All meetings and workshops between project components are properly documented and published to other project components. Any concerns by project stakeholders have been and will be continued to be responded to appropriately by the management staff and other relevant project components. Please see also minutes of a Forestry Committee meeting in PlanVivo PDD Annex 9a p. 254.and doc 05-07 (libro de actas Santa Fé)

06 CO_2-fixation

The following pages are templates to document the parameters

- Future CO_2-fixation
- Present CO_2-fixation (The results of a forest inventory)

Name of the Project	CARBON SEQUESTRATION THROUGH REFORESTATION AND IMPROVED LAND USE IN THE BOLIVIAN TROPICS BY SMALLHOLDERS ArBolivia Project
Version of the Standard	CarbonFix Standard v3.1

Description of Management Units:
Small parcels are planted by the farmers. Based on this planting concept the management Units have been selected based on tree species and different planting years of each species. As one farmer is mostly planting one tree species in one year there is mostly one MU within on farmers plot. But as the MU selection is based on planting year and tree species farmer A and farmer B could be part of MU 0001 or 0002 etc.

Detailed overview of the management units you could find in the document “06-08 CO2_scientifc_growthmodel_ARB_29092012.xls”

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 001, 014, 017, 040				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 7 years Mean Timber (volume) grown during this time: 121 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.49 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value National default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-01 INFORMACIÓN TÉCNICA PARA EL PROCESAMIENTO INDUSTRIAL DE 134 ESPECIES MADERABLES DE BOLIVIA _WD.pdf p. 18 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L6, Schyzolobium amazonicum - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**309 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation woody biomass [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Management Unit(s) 0015, 018, 030, 041, 049				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 7 years Mean Timber (volume) grown during this time: 121 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.52 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value International default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-02 Appendix 1 - List of wood densities for tree species from tropical America, Africa, and Asia_WD, p. 19 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L7, Stryphnodendron purpureum - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**328 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 003, 019, 031, 042				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 11 years Mean Timber (volume) grown during this time: 132.5 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	1.5 0.67 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value International default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-03 Aspidosperma macrocarpon_WD.pdf, page 4 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_10022012, cell K/L8, Aspidosperma macrocarpon - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**462 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 004, 020, 032, 043, 050				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 13 years Mean Timber (volume) grown during this time: 106 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.55 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value National default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-01 INFORMACIÓN TÉCNICA PARA EL PROCESAMIENTO INDUSTRIAL DE 134 ESPECIES MADERABLES DE BOLIVIA _WD.pdf, p.17 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L9, Calophyllum basiliense - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**303 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 005, 021, 033, 044, 051,				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 13 years Mean Timber (volume) grown during this time: 106 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.58 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value National default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-01 INFORMACIÓN TÉCNICA PARA EL PROCESAMIENTO INDUSTRIAL DE 134 ESPECIES MADERABLES DE BOLIVIA _WD.pdf, p. 18 Reference: 06-11 source14_IPCC_-_GPG _Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L10, Centrolobium tomentosum - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**320 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 006, 022, 034, 045, 052				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 13 years Mean Timber (volume) grown during this time: 149 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.52 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value National default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-02 Appendix 1 - List of wood densities for tree species from tropical America, Africa, and Asia_WD.pdf, p. 14 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L11, Guarea rusby - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**403 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 007, 0,16, 023, 035, 046, 053				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 13 years Mean Timber (volume) grown during this time: 149 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.60 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value National default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-01 INFORMACIÓN TÉCNICA PARA EL PROCESAMIENTO INDUSTRIAL DE 134 ESPECIES MADERABLES DE BOLIVIA _WD.pdf, p. 17 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L12, Tapirira guianensis - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**465 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 008, 024, 036, 047, 054				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 11 years Mean Timber (volume) grown during this time: 106.5 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.50 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value International default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-02 Appendix 1 - List of wood densities for tree species from tropical America, Africa, and Asia_WD.pdf, p. 9 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L13, Tectona grandis - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**277 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 009, 025				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 13 years Mean Timber (volume) grown during this time: 106 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.44 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value National default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-02 Appendix 1 - List of wood densities for tree species from tropical America, Africa, and Asia_WD.pdf, p. 20 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L14, Virola flexuosa - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**243 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation woody biomass [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 0010, 026, 037				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached:18 years Mean Timber (volume) grown during this time: 74 m3/ha		Inventories used to adapt the growth-model:NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.77 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value National default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-01 INFORMACIÓN TÉCNICA PARA EL PROCESAMIENTO INDUSTRIAL DE 134 ESPECIES MADERABLES DE BOLIVIA _WD.pdf, p.19 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L15, Buchenavia oxycarpa – The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**297 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 0011, 027, 038, 0,48				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 18 years Mean Timber (volume) grown during this time: 74 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.91 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value International default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-10_table wood density FAO PAFBOL.pdf, p.3 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L16, Dipteryx odorata - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**351 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation woody biomass [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 0012, 028, 039				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached:18 years Mean Timber (volume) grown during this time: 128 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.66 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value International default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-01 INFORMACIÓN TÉCNICA PARA EL PROCESAMIENTO INDUSTRIAL DE 134 ESPECIES MADERABLES DE BOLIVIA _WD.pdf, p.19 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L17, Terminalia amazonica - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**440 tCO_2/ha**		

Formula of calculation
CO_2-fixation [tCO_2/ha] = CO_2-fixation $_{woody\ biomass}$ [tCO_2] / Area of Management Unit [ha]

Conversion
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Future CO_2-fixation

Management Unit(s) 013, 029				
Calculation method: 2) Rotation forestry Time period until the Mean Stand volume is reached: 15 years Mean Timber (volume) grown during this time: 74 m3/ha		Inventories used to adapt the growth-model: NA		
Biomass Expansion Factor Wood density Carbon fraction C to CO_2 factor Root-to-Shoot ratio	2 0.75 0.5 3.666 0.42	Biomass Expansion Factor Wood density Root-to-Shoot ratio	International default value International default value International default value	Reference: 06-09_table 3A1_10.pdf, Tropical BEF2 (overbark) Reference: 06-01 INFORMACIÓN TÉCNICA PARA EL PROCESAMIENTO INDUSTRIAL DE 134 ESPECIES MADERABLES DE BOLIVIA _WD.pdf, p.19 Reference: 06-11 source14_IPCC_-_GPG_-_Default_values_Annex 3A.1.10.pdf, Tropical Forest Broadleaf lower limit
Justification of the growth-model		06-08 CO2_scientifc_growthmodel_ARB_29092012, cell K/L18, Terminalia oblonga - The growth model is based on historical experience of each tree species in Bolivia. In addition, scientific studies and growth stocks have been used as a comparison.		
Future CO_2-fixation		**289 tCO_2/ha**		

Formula of calculation
Baseline [tCO_2/ha] = (Baseline woody biomass [tCO_2] + Baseline non-woody biomass [tCO_2]) / Eligible planting area [ha]

08 Baseline

The following pages are templates to document

- Baseline woody biomass
- Results of the inventory on 'aboveground woody biomass'
- Baseline non-woody biomass

Name of the Project	CARBON SEQUESTRATION THROUGH REFORESTATION AND IMPROVED LAND USE IN THE BOLIVIAN TROPICS BY SMALLHOLDERS - ArBolivia Project
Version of the Standard	CarbonFix Standard v3.1

Describe shortly the process how the parameters were determined.
Project activities are developed on 4 different land use types. • degraded grassland • degraded grassland with trees • Annual crops • Cropland: perennial crops in their final stage of production All 4 land use types are considered as different strata in the project. For all 4 strata a separate baseline analysis is carried out, since change in carbon stocks in time might be different. See supporting document, Baseline "08-01 ArBolvia PlanoVivo_TechSpecs.pdf" p. 19-24 The baseline scenarios for the 4 different land use types show that changes in carbon stocks in all scenarios can be assumed to be zero. However, it is still necessary to quantify the carbon stocks for each stratum since due to project activity carbon removals will occur due to site preparation, or canopy closure which competes with the vegetation in the baseline. Carbon stocks are based on data from 08-02 *"Chapare WP1 Prefeasibility Report – Tables v4.pdf-p.3"* and 08-03 *Pre-feasibility study for a CDM-AR project in the Cochabamba Tropics. P12*

Overview on the results of the baseline analysis:

	ID	Area	Eligible area	Baseline woody biomass	Baseline non-woody biomass
Stratum	1 - degraded grassland	176	176	0 tCO2/ha	20 tCO2/ha
Stratum	2- degraded grassland with trees	8	8	Total Non woody and woody 49 tCO2/ha	
Stratum	3 - Annual crops	809	809	0 tCO2/ha	27 tCO2/ha
Stratum	4 - Perennials	196	196	0 tCO2/ha	56 tCO2/ha
Sub-Total		**1189**	**1189 ha**	**- tCO2/ha**	**- tCO2/ha**
			Total		**31 tCO2/ha**

Carbon benefits will be calculated for each of the different baseline strata. Assuming the plantations will be distributed among the strata as shown above this means the average amount of existing carbon in the baseline is 8.4 tC/ha which equals to 31 tCO2e.

Degraded grassland	=	176 ha	* 20 tCO2/ha	=	3520 tCO2
degraded grassland with trees	=	8 ha	* 49 tCO2/ha	=	392 tCO2
Annual crops	=	809 ha	* 27 tCO2/ha	=	21843 tCO2
Perennials	=	196 ha	* 56 tCO2/ha	=	10976 tCO2

SUM = 36731 tCO2 / 1189 ha = **31 tCO2/ha**

Formula of calculation
Baseline non-woody biomass [tCO_2] = (Baseline aboveground non-woody biomass [tCO_2] + Baseline belowground non-woody biomass [tCO_2]) * Eligible planting area [ha]

Selected carbon pools
- Aboveground non-woody biomass = Fresh biomass * Dry-to-Wet ratio * Carbon fraction * C to CO_2 factor
- Belowground non-woody biomass = Aboveground non-woody biomass * Root-to-Shoot ratio

Baseline non-woody biomass

Stratum	**1 - degraded grassland**	
Study used: 08-02 CHAPARE - WP1 Prefeasibility Report - Tables v4.pdf - p.3	Result: … tons of dry biomass per ha	
Biomass 5.5 tC / ha (-) Wet-to-Dry ratio - Carbon fraction 0.5 C to CO2 factor 3.666 Root-to-Shoot ratio -	Fresh biomass - Wet-to-Dry ratio - Root-to-Shoot ratio -	Reference: Reference: - Reference: -
Baseline non-woody biomass	**20 tCO2/ha**	

Estimated Carbon Baseline of different landuse types:
Pasture = 5.5 tC/ha → 20 tCO2/ha

Image 1grassland

Formula of calculation
Baseline woody biomass [tCO_2] = (Baseline aboveground woody biomass [tCO_2] + Baseline belowground woody biomass [tCO_2]) * Eligible planting area [ha]

Selected carbon pools
- Aboveground woody biomass = Stem volume * Biomass Expansion Factor * Wood density * Carbon fraction * C to CO_2 factor
- Belowground woody biomass = Aboveground woody biomass * Root-to-Shoot ratio

Baseline woody biomass

Stratum		**2 - degraded grassland with trees**		
Study used 08-01 CHAPARE - WP1 Prefeasibility Report - Tables v4.pdf-p.3		Result: 13.5 tC per ha		
Biomass Expansion Factor	-	Biomass Expansion Factor	-	Reference: -
Wood density	-	Wood density	-	Reference: -
Carbon fraction	0.5			
C to CO2 factor	3.666			
Root-to-Shoot ratio	-	Root-to-Shoot ratio	-	Reference: -
Baseline woody biomass		**49 tCO2/ha**		

Estimated Carbon Baseline of different landuse types: Pasture = 5,5 tC/ha and Mix of pasture, base soil and banana = 8,0tC/ha .
The strata mix of pasture, bare soil, banana was more or less a value for all land which was not easy to qualify under one of the other strata. This strata also also includes pasture with shrubs/trees, see pictures below.

Image 2 grassland with trees

The baseline is calculated as follows: 5.5tC/ha + 8.0tC/ha = 13.5tC/ha ➔ 49 tCO2/ha

Stratum	**3 - Annual crops**
Study used: 08-01 CHAPARE - WP1	Result: - 7.5 tC per ha

Prefeasibility Report - Tables v4.pdf, p.3				
Biomass Expansion Factor	-	Biomass Expansion Factor	-	Reference: NA
Wood density	-	Wood density	-	Reference: NA
Carbon fraction	0.5			
C to CO2 factor	3.666			
Root-to-Shoot ratio	-	Root-to-Shoot ratio	-	Reference: NA
Baseline woody biomass		**27 tCO2/ha**		

Estimated Carbon Baseline of different landuse types:
Cultivated agriculture = 7,5 tC/ha ➔ 27 tCO2/ha

Image 3 – annual crops (maize, rice, etc.)

Stratum		**4 - Perennials crops**		
Study used: 08-01 Zomer et al.zip, CHAPARE - WP1 Prefeasibility Report - Tables v4.pdf, p.4		Result: - 15.3 tC per ha		
Biomass Expansion Factor	-	Biomass Expansion Factor	-	Reference: -
Wood density	-	Wood density	-	Reference: -
Carbon fraction	0.5			
C to CO2 factor	3.666			
Root-to-Shoot ratio	-	Root-to-Shoot ratio	-	Reference: -
Baseline woody biomass		**56 tCO2/ha**		

Perennials are mainly defined within the project as areas with banana, palms,papaya, pine apple, citrus and maize.

Image 4: left – banana, right - palms

Estimated Carbon Baseline of different landuse types: Banana = 12 tC/ha, Palm heart = 18.6 tC/ha
As the Carbon stored in Palm and Banana areas is the highest we calculated the Baseline as follows:
12tC/ha + 18.6tC/ha = 30.6tC/ha
As the area is covered with various perennials (banana, palms,papaya, pine apple, citrus and maize) we use a 50:50 ration, between the carbon amount of Banana and palms. 15.3tC/ha ➔ 56 tCO2/ha

Formula of calculation
Leakage [tCO_2/ha] = Leakage aboveground woody biomass [tCO_2] / Eligible planting area project area [ha]

09 Leakage

The following pages are templates to document

- Leakage aboveground woody biomass - category a. to e.
- Leakage aboveground woody biomass - category f.

Name of the Project	CARBON SEQUESTRATION THROUGH REFORESTATION AND IMPROVED LAND USE IN THE BOLIVIAN TROPICS BY SMALLHOLDERS - ArBolivia Project
Version of the Standard	CarbonFix Standard v3.1

Describe shortly the process how the parameters were determined.
The risk of leakage or an unintended loss of carbon stocks outside the project boundary, attributable to the project activities is considered to be insignificant, for the reasons outlined below: The project is managed so as to avoid leakage. This means that forestry production will not replace agricultural production. The approved methodology AR-AMS0001/version 05 has been used. This choice of methodology is justified because: • The proposed activity is “grasslands to forested lands” and “cropland to forest land”; • Project activities are implemented on lands where < 10% of the total surface project area is disturbed as a result of soil preparation for planting; • The displacement of households or activities due to the implementation of the project activity is less than 50%; • The displacement of grazing animals is less than 50% of the average grazing capacity of the project area. • The proposed activity is not a de-bundled component of a larger project activity. According to AR-AMS0001/version 05 those project emissions that need to be taken into account are limited to emissions from the use of fertilizers. The trees are planted on previous cropland, the farmers will be allowed to grow crops and use fertilizers as they did before the project activity started. This does not result in an increase in emissions compared with the pre-project activity and thus does not need to be counted as leakage. Due to the implemented measures of improved land use planning, agroforestry, silvopastoral areas (see below), environmental monitoring and education the project is generally believed to have a positive effect on land use in the project area and therefore rather positive leakage is expected.

Describe shortly the selection of your categories.	
a. Fuelwood use	NA, insignificant in project area
b. Charcoal burning	NA, insignificant in project area
c. Harvesting of timber	NA, Covered by calculation of mean stand biomass approach. Is not taking place in areas where planting activities take place. Might be the case in residuel primary forests, but not due to the project. Even more, measurements taken by the project might have even a positive effect and it is more likely that the project reduces deforestation.
d. Agriculture farming	NA Land deforested 10 or more years prior to reforestation had previously been subjected to a “slash and burn” system. After rice cropping, maize is normally planted and after that it is left fallow. In the first fallow period it normally takes at least 4 years before the land can be used for agriculture again. After a second cultivation period, it takes at least 7 years before it can be used again for cropping and after that it takes approximately 10 years, even on the better soils, before land can be recovered. On the poorer soils this period can be up to 15 years. Moreover, crop production per hectare decreases as the fallow period increases. If the fallow period is not extended crop yields fall even further. On croplands established 10 years ago or more and which are now in the second and third cycle, yields fall to 70% or less to of yield levels in the 1st cycle. On croplands established before 1990 and which are now in the 4th or subsequent cycle, the average annual crop yield falls to 50% or less of yield levels in the 1st cycle. Some farmers are using their cropland almost continuously making use of fertilizers. In areas where fertiliser is used, soil degradation also continues and annual crop yield decreases, rendering the use of fertiliser uneconomic. Due to the relatively small level of foregone crop production, it can be evidenced that shifted activities due to tree planting can be absorbed by the surrounded agricultural lands. Integrated Land use Planning will ensure farmers have sufficient land for their crops generating income in the short, tree planning is not competing with their income or food security in the short, mid and long term.
e. Resettlement	NA There is no displacement of households due to the project, since only a small portion of the farmland is reforested. In fact, the project will actually serve to reduce the risk of migration from the area to nearby forest areas due to better land use practices. There is a current tendency for farmlands to become degraded through inefficient land use practices. Once productivity has fallen excessively as a result of soil degradation, farmers simply move to new areas of forest in the vicinity. Introducing agro forestry systems, which are more sustainable over time than rice, yield higher incomes per hectare and per working day and generate subsistence products for the farmer and his family. They are also contributing to stabilize

Describe shortly the selection of your categories.	
	settlements likewise tree plantations as they represent a long term invest on the farmers lands. The “Integrated Land Use” approach outlined is intended to introduce efficient land use practices across the entire farm, whilst also taking into consideration the current and future needs of the farmer family. Sustainable crop and timber production will generate income in the short, mid, and long term, a factor which subsequently reduces the risk of farmers moving to other, e.g. forested, places.
f. Livestock grazing	NA Leakage on pasture land through shifting of activity will occur in less than 10% of cases, since the amount of cattle which may be moved to areas outside the project boundary is not significant. It can be evidenced that trees planted on pasture land will not cause deforestation, since the planted areas are only a small portion of the total degraded pasture land, the total pasture land on a farmer’s parcel and the other surrounding areas, such as pasturing on the side of the road, are likely to receive the shifted activities (Knoblauch 2007, Sejas 2007). Therefore, in accordance with AR-AMS0001/version 05 (28), leakage due to displacement of grazing activities is considered insignificant. Improving grazing systems introducing silvopastoral systems and improved pastures is also part of the project in order to reduce deforestation of primary and secondary forests. Moreover, grazing systems and silvipastoral systems will only be implemented on roughly 5% of the project area. Therefore, in accordance with AR-AMS0001/version 05 (28), leakage due to displacement of grazing is considered insignificant.

General Terms & Conditions

(Version 3.1)

Parties

- CarbonFix e.V., Friedrichstr. 15, 70174 Stuttgart, Germany (*CarbonFix*)
- You (*User*)

Recitals

- These General Terms & Conditions (GTC) supplement the CarbonFix Standard (CFS) and set further criteria for its usage.
- The *User* wishes to use the CFS in accordance with the rules of the CFS and these GTC as amended from time to time (see section 6).

Content

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5. Concerning CO2-buyers

5.1. By purchasing CO2-certificates the *User* declares/agrees to the following:

a. In case of a project exclusion in accordance with the chapter 'Project exclusion' of the CFS, to accept the consequences and not file suit against *CarbonFix*.

b. Any legal consequences of a project exclusion have to and will be carried out between the contractual parties.

6. Privacy and User Information

6.1. The *User* allows *CarbonFix* to use its personal information for administrative use as well as for sending relevant information, including the newsletter.

6.2. CarbonFix stores all information of the User that is necessary for running the CFS most efficiently.

6.3. *CarbonFix* will not allow third parties access to the *User* information without its prior approval, unless *CarbonFix* is required to do so by law.

6.4. The *User* may request *CarbonFix* to access and correct its personal information at any time.

7. Intellectual Property / Copyright

7.1. The CFS including its name, logo, texts and images are copyrighted property of *CarbonFix*. All rights reserved. The communication package as referred to in the chapter 'Communication policy' of the CFS applies.

7.2. Each party acknowledges and agrees that, except for the rights expressly provided for in the CFS, these GTC and any rights otherwise agreed upon between the parties, neither party shall acquire any rights, title or interest in or to any (pre-)existing Intellectual Property Rights, including but not limited to name and logo of the other party.

8. Liability and Limitation

8.1. CarbonFix does not give any representation, warranty or guarantee with the CFS documents. *CarbonFix* shall not be liable for any mistakes or damages resulting from the use of this information unless it is based on gross negligence or intention. This limitation does not apply to damages to life, body or health.

8.2. *CarbonFix* expressively disclaims any liability for losses due to project rejections or exclusions.

8.3. *CarbonFix* is not responsible for any actions or omissions of any of the project participants.

8.4. The compensation of lost CO2-certificates by the CFS buffer (as outlined in the chapter 'CFS Buffer') will be provided to the extent possible. There is no title for being compensated by the buffer. CFS is not liable in any way for the functioning or a lack of compensation by the buffer.

9. Indemnity

9.1. To the extent permissible by law, the *User* indemnifies *CarbonFix* from and against all proceedings, actions, claims, demands, losses, liabilities, damages, costs and expenses which may be made or brought against or suffered or incurred by using the CFS.

9.2. The indemnities in these GTC are continuing obligations of the *User*, separate and independent from other obligations and survive the termination of these GTC. Furthermore they are absolute and unconditional and unaffected by anything that might have the effect of prejudicing, releasing, discharging or affecting in any other way the liability of the party giving the indemnity.

10. Legal Disputes

10.1. German Law is applicable for any legal disputes with *CarbonFix*. The place of jurisdiction is Staufen, Germany (Registrar of Association: Amtsgericht Staufen No. VR 429).

11. Relationship between the Parties

11.1. Unless otherwise stated, *CarbonFix* is permitted by the *User* to use its name (including logo) for all purposes concerning the CFS.

11.2. Nothing in these GTC will be taken to create a relationship between the parties of agency, joint venture, fiduciary relationship, partnership or other joint undertaking.

12. Procedural

12.1. Any unclear or unsolved issue shall be dissolved by the technical board of *CarbonFix*.

12.2. These GTC shall not be overruled by opposing rules or regulations of the addressed *User*.

12.3. Rules between an individual *User* and *CarbonFix* that are different to the ones as set out in these GTC are only valid if they are in written form.

12.4. The rights and obligations herein are personal to both parties and may not be assigned or delegated to a third party without the express written consent of the other party.

12.5. If individual terms of these GTC are invalid or unenforceable the validity of other terms shall not be affected.

Name of the Project	CARBON SEQUESTRATION THROUGH REFORESTATION AND IMPROVED LAND USE IN THE BOLIVIAN TROPICS BY SMALLHOLDERS - ArBolivia Project
Version of the Standard	CarbonFix Standard v3.1

I have read, understood and agree to the GTC of *CarbonFix*.

Anko Arthur Stilma
General Manager
Sicirec Bolivia ltda

Cochabamba, 17th of April 2012
Place, Date

Signature