

FLORESTAL SANTA MARIA PROJECT (FSM-REDD PROJECT) MONITORING REPORT



in association with VO2 Desenvolvimento Empresarial

Prepared by PLANT Environmental Intelligence

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1 PROJECT DETAILS

1.1 Summary Description of Project

The proponent and developer of the Project is Florestal Santa Maria S/A. PLANT Environmental Intelligence is technically responsible for this VCS-PD, which had contributions of AVIX in deforestation risk analysis and similarity analysis. All legal matters are in responsibility of Pinheiro Neto Advogados' lawyers. General Coordination for this initiative was performed by VO2 Desenvolvimento Empresarial. The electronic addresses of the companies cited above are available in item "1.4 Other Entities Involved in the Project" of this VCS-PD.

The FSM forest estate, a rural property solely dedicated to sustainable management of natural forests, is located in the Municipality of Colniza, some 30 km from the township, in the North western region of the State of Mato Grosso, approx. 1,100 km north from the State Capital of Cuiabá. The geopolitical region is within the Brazilian Legal Amazon. The municipality of Colniza has been fairly recently emancipated, in the year of 1998 and it previously belonged to the municipality of Aripuanã, founded in 1946.

The FSM-REDD Project was conceived to give the opportunity for this forest management company to take full advantage of the REDD regulatory system under development by means of the VCS System. The specific area of the Carbon Project is a section of a larger colonization initiative, initiated in 1975, by means of the legally established state effort to develop the northern region of the State of Mato Grosso.

This larger colonization initiative was developed by COLNIZA – Colonização Comércio e Indústria Ltda (Colniza Colonization Company – hereafter referred as CCC). This company was an association between ESCOL – Cia Agricola e Comércio (Esteve Irmãos Group), G. Lunardelli S.A. – Agricultura Comércio e Colonização (G. Lunardelli Colonization Company – hereafter referred as GLCC) and other minorities.

GLCC was founded by Italian immigrant Geremia Lunardelli, who became one of the most prominent rural development entrepreneurs in frontier agriculture in Brazil, having his history associated with the establishment of the coffee export market in the 1920's. For over 80 years, the GLCC has been planning and implementing land-use colonization projects in many states of Brazil (São Paulo, Paraná, Mato Grosso and others), in addition to some regions in Paraguay. After the death of entrepreneur Geremia, in the 60's, G. Lunardelli's family continued his former activities with colonization projects.

The objective of CCC was to participate in the opportunities of development in the northern region of the State of Mato Grosso (MT State). On January 9, 1975, the CCC acquired 400,000 hectares from ancient Company for Development of the State of Mato Grosso - CODEMAT (Companhia de Desenvolvimento do Estado de Mato Grosso). These 400,000 hectares were part of a State-led development effort for the northern region of the MT State. This was a much larger program involving 2,000,000 hectares, assigned by the State Government with a former participation of the Federal Government, in order to implement an Amazonian development program.

From this larger area, many municipalities were established, such as Colniza, Cotriguaçu, Juruena, Juína, and Alta Floresta. All these initiatives had the intention to take form to integrate the larger Brazilian northern region to the ongoing development of the country. At that time, the Federal Government of Brazil had publicized many concerns regarding the vulnerability of territorial integrity and sovereignty. The colonization of the north of the MT State was a very strategic component.

The following Figures (1-3) demonstrate some aspects of geographical distribution.

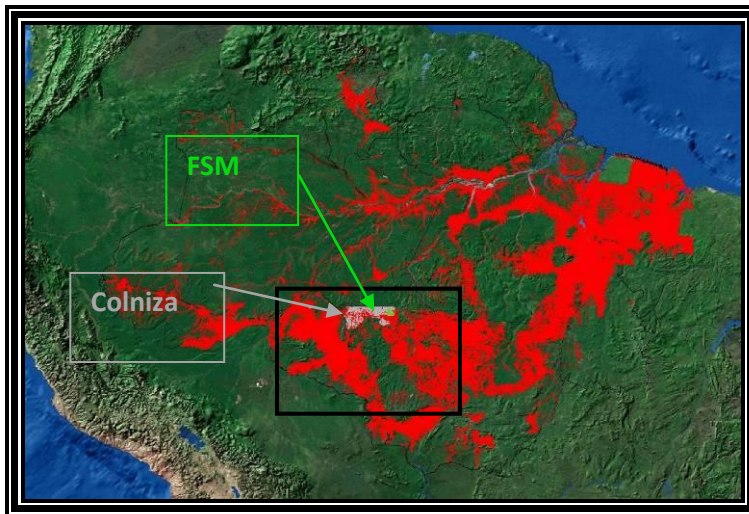


Figure 1. Location of the FSM farm (green dot) inside the Municipality of Colniza (grey polygon), and in the context of the deforestation process in the Amazon Region (highlighted in red), according to the National Space Research Institute (INPE) (2008)

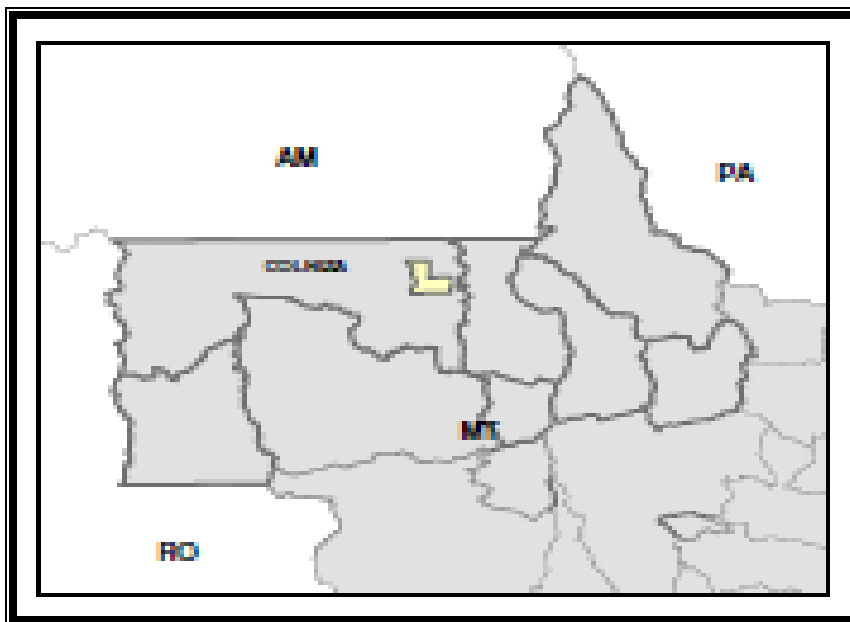


Figure 2. Location of FSM farm, within the territory of the municipality of Colniza

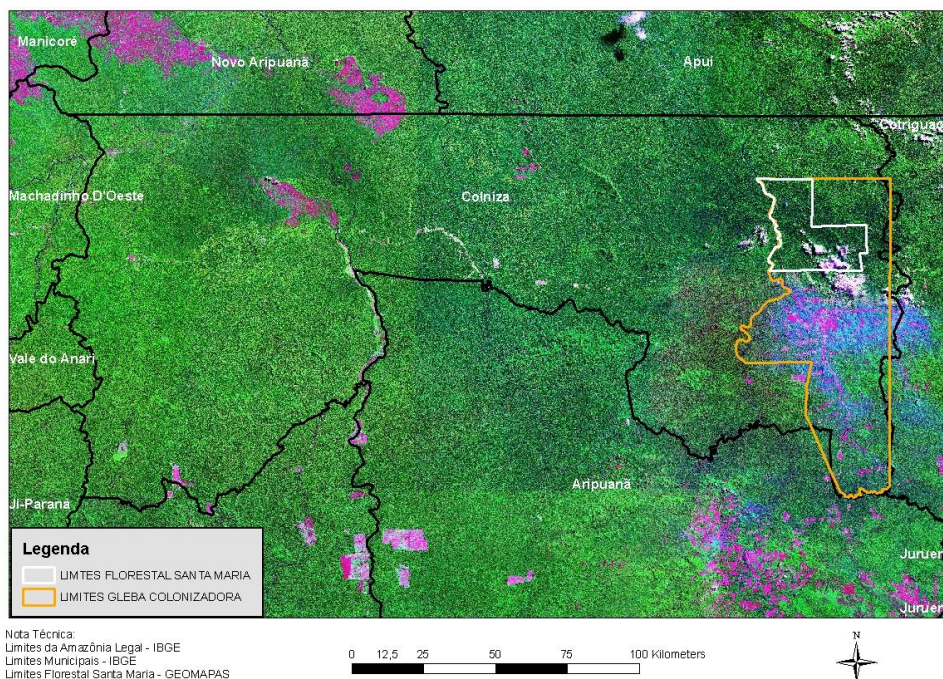


Figure 3. Location of Reference Area and Project Area in relation to the municipality of Colniza

Eventually, given the evolution of colonization plans, the original area of 400,000 hectares was divided in 3 zones under the following denomination:

- 1) South Zone
- 2) Central Zone
- 3) North Zone

The legal ownership history related to this area fractioning is demonstrated in the Ownership Succession (*Cadeia Sucessória*), illustrated in the Certificate issued by the Real Estate Registry Office (*Cartório de Registro Geral de Imóveis*), of the Sixth Office (*Sexto Ofício*), 3rd Circumscription (*3ª Circunscrição*), of the Municipalities of Aripuanã and Juina, on April 25, 1993 (see item “1.12.1 Proof of Title” of this VCS-PD). Under such zones, the Real Estate Registry recorded the following information:

- 1) South Zone (80,000 hectares): located at the south of the current municipality of Colniza, under ownership of G. Lunardelli (26,530 ha), ESCOL (26,530 ha), and new buyers (26,940 ha).
- 2) Central Zone (180,000 hectares): located at the Centre of the 400,000-hectares glebe, under ownership of COLNIZA – Colonização, Comércio e Indústria Ltda. This area was assigned to founding the current urban area of the municipality of Colniza. This zone was divided and developed in small land plots, and planned roads were built

to enable colonization. Part of this zone was subsequently settled by the National Institute for Rural Settlement and Agrarian Reform (INCRA) within the agrarian reform process of the government of Brazil.

3) North Zone (140,000 hectares): located at north of current municipality of Colniza. This zone was originally divided into 4 land registrations:

- a. G. Lunardelli Noroeste – 47,500 hectares;
- b. G. Lunardelli Norte – 22,500 hectares;
- c. ESCOL Norte – 47,500 hectares;
- d. ESCOL (Florita) Norte – 22,500 hectares.

The Florestal Santa Maria Farm (Project Area) had been formed on July 10, 2002, by merging the GLCC properties (items “a” and “b”), totalizing 70,000 hectares, according to Table 1.

Table 1. Scheme illustrating the original division of lands, contextualizing the Project Area (FSM Farm)

400,000 ha	South Zone	80,000 ha	G. Lunardelli	26,530 ha	} FSM
			ESCOL	26,530 ha	
			New buyers	26,940 ha	
	Central Zone	180,000 ha	COLNIZA Colonizadora	180,000 ha	
	North Zone	140,000 ha	G. Lunardelli Noroeste	47,500 ha	
			G. Lunardelli Norte	22,500 ha	
			ESCOL Norte	47,500 ha	
ESCOL (Florita) Norte			22,500 ha		

According to INCRA Certificate issued on January 25, 2005 (see item “1.12.1 Proof of Title” of this VCS-PD), through subsequent geo-referencing, the total area of FSM farm was established in 71,713.959031 ha.

Some 20 years after the initial land purchase, CCC proposed the transfer of 17,500 hectares to INCRA. The main reason was to address the settlement of landless agricultural workers, which were selected by INCRA on April 22, 1991 as beneficiaries of a rural settlement in the northern region of Brazil. The land transfer to INCRA was motivated by the lack of infrastructure for implementing the initial colonization project, as well as uncontrolled pressure for land occupation. Thus, by showing good will, CCC intended to address this institutional handicap and create

means to attract the government to act more closely to the land occupation process underway in the region. This first settlement was established in the Central Zone (number 2 in the list) nearby the administrative urban area of Colniza (municipality and county)¹. In other words, at that time CCC was already seeking to mitigate illegal land occupation.

Another 17,500 hectares were later part of a second transfer agreement that entered into with INTERMAT (Instituto de Terras do Estado do Mato Grosso; Institute of Lands of the State of Mato Grosso) for the settlement of families evicted from other illegally occupied lands.

Between 2000 and 2005, illegal occupation in other regions such as State of Rondônia, Pará and other states, were led by professional land-grabbers (mainly over private lands)², generating uncontrollable pressure over original landowners (CCC, GLCC, and ESCOL). This came to be extremely threatening, given the lack of governmental infrastructure and law enforcement to preserve privately owned lands. These factors induced the original landowners to find ways of selling the remaining lands in the Central Zone. In this context, the original colonization project was made unfeasible, owing to every sort of uncontrolled and illegal occupation of lands. In short, a failure of the colonization project, caused by social problems and lack of governmental infrastructure and law enforcement created the conditions for disorganized and illegal occupation, right on the opposite direction that the efforts of colonization were established at the outset of the enterprise, followed by a massive deforestation as a means to occupy the land with cattle and eventually agriculture.

The deforestation pressure in the State of Mato Grosso became then mostly the result of illegal land-grabbing by invasion of private lands, using to such objective logging, slash-and-burning and cattle-ranching. However, other factors contributed to deforestation in the State of Mato Grosso. According to a recent publication by the Amazon Institute for Environmental Research (IPAM), the causes of tropical deforestation are apparently the same in different regions of the planet and can directly be accounted for (a) conversion of forest areas into areas for agriculture and cattle breeding for the purpose of land possession or not; (b) timber extraction; and (c) land-clearance by fire. There also indirect causes such as (d) governmental subsidies and incentives to agriculture and cattle breeding; (e) investment policies in infrastructure projects; (f) illegality of land possession and ownership; (g) lack of state governance and law enforcement; and (h) market drivers, such as rising commodities prices³. All of these patterns can be found in the Brazilian Amazon and specifically in the State of Mato Grosso.

The several difficulties faced by local authorities in exercising control over public and private lands were due to the lack of support from State and Federal Jurisdictions. According to the INPE, 2009, the deforestation process in the municipality of Colniza increased from 770 km² in

¹ Note: in Brazil, a municipality is composed of both urban and rural areas, thus the different approaches of public administration of rural areas is undertaken at local level by both the township and city council.

² Invasion of public lands was less prone to legal settlement, whereas private lands that were not deemed “productive” could be acquired by means of adverse possession (*usucapião*) and are more easily subject to titles falsification and land grabbing.

³ Free translation of “REDD no Brasil: um enfoque amazônico: fundamentos, critérios e estruturas institucionais para um regime nacional de Redução de Emissões por Desmatamento e Degradação Florestal – REDD. – Brasília, DF: Centro de Gestão e Estudos Estratégicos, 2011, page 29.”

2000 to over 3,300 km² in 2007, which represents an increase of 328% in deforestation rate over a period of only 7 years.

According to local testimonials from EMPAER⁴, SAM⁵ and INDEA⁶ (these are Municipal and State Agencies with offices in Colniza), a great amount of land-grabbers who conducted initial processes of illegal land occupation (by grabbing private farms) are still installed in the municipality. They are still organized, awaiting to take possession of unprotected private lands, taking all sorts of actions in order to find and invade “unproductive” private lands, with the primary objective of logging with no legal license. This is mainly due to the fact that lumber companies still carry out the practice of spot-purchasing of logs that are delivered at the yard every day. These land-grabbers have mechanisms to rapidly catching hold of lands and immediately exploiting local timber by means of clear-cutting the forests. The immediate timber revenues provide the necessary budget to implementing pasture and agriculture. On the other hand, some of these illegal invasions, when not contested by original land owners, can give the invader possession rights to claim such land to his/her ownership.⁷

Associated with the lack of assistance from governmental offices (e.g. INCRA) in resolving legal and documental land tenure issues in Colniza, as soon as an invasion or occupation of land takes place, the first order of business is to deforest as much land and plots as possible, far above the limits regulated by Brazilian Forest Code, which imposes the preservation of 80% of land as Legal Reserve (*Reserva Legal*). In this context, the common land-use practices are technically archaic and production scale does not reflect the real potential of land, resulting in low economic return for families, and inducing them to invade new areas in the region, as the only alternative of earning their subsistence from timber as an immediate source of income. This scenario induces the cycle of continuous land invasions and social conflicts, which causes damages to environment and communities in the region.

The current FSM farm is presently subject to risks of invasions by squatters. Since after partition of the original 400,000 hectares, the farm has undergone increasing invasions mainly facilitated by the distribution of lands promoted by INCRA, which settled hundreds of families in their land spots. This movement was further intensified after the year 2000. Once installed nearby the farm boundaries, neighbouring families lead by professional land-grabbers started to occupy and deforest new lands, to exploit timber as immediate source of earnings. These illegal occupations were fomented by some sawmills in the region, which bought the harvested timber, and further stimulated land-grabbing and logging. As the next step of land use, families implemented coffee crops and pasture on deforested sites. In the present, the municipality of Colniza is predominantly covered by pasture (250,000 hectares) and coffee cultivation (12,500 hectares) (Brazilian Geography and Statistics Institute Foundation - IBGE 2009). In Colniza, the growth rate for the bovine herd has been exponential over these last years, rising from 32,138 heads of cattle in 2001 to 217,796 heads in 2007, according to the IBGE, as shown in Table 2. This growth represents a 578% increase in the size of the bovine herd in Colniza over a period of only seven years. This growth is directly correlated to the increase in the deforestation rates in Colniza,

⁴ Agency for Research, Assistance and Rural Extension of the State of Mato Grosso.

⁵ Municipal Agriculture Office.

⁶ Institute for Defense of Agriculture and Cattle Razing of the State of Mato Grosso.

⁷ Characterizing steady land tenure, known in the Brazilian constitution as “usucapião” or “Uti Possiditis”: the acquisition of property by long possession without claim by others.

which leaped from 88,720 hectares to 325,170 hectares of deforested area over the same period of time, an increase of close to 266%, as shown in Figure 5.

The FSM farm is one of the few sites in the region that still preserves all native forest. Nowadays, indeed, it is the only site that conserves a great area of continuous native vegetation (71,713 hectares) from the original 400,000 hectares of the initial colonization project.

Several illegal occupations in the FSM farm were eradicated and registered by local authorities and by the farm self-vigilance system. These invasions originated judicial prosecutions for repossession of land tenure. Thanks to an extensive self-vigilance system and landowner's investments and efforts, these invasions have not caused significant damage to original vegetation. However, it is known and documented that the FSM farm was already totally divided in lots, and several trails had been made to ultimate occupation by land-grabbers inside the whole farm. As 100% of FSM farm is reserved for Sustainable Forest Management, it is considered as a Great Productive Estate (*Grande Propriedade Produtiva*), according to categorization by INCRA (Figure 4).

SOCIAL AND HUMAN ASPECTS:

It is interesting observing that, in the original area of the 400,000 hectares, differently from the States of Amazonas and Acre, there were no populations of: (I) native Brazilian, (II) Riparians and (III) Forest People.

(I) According to research carried out by National Indian Foundation (FUNAI), villages and isolated native Brazilian were located in regions outside the Colonizing area. Reserve areas were created for this purpose. Namely:

- a. T.I. Escondido;
- b. T.I. Arara do Rio Branco and
- c. T.I. Rio Pardo (with defined expansion Project, under discussion).

Note. : Maps and Certificates are at the auditors' disposal.

Key: T.I.: Territory of native Brazilians

(II) Due to the rather uneven condition of the water flow in this part of Aripuanã River, the main river from the region (river rapids Santa Maria – origin of the name of the farm), its navigability is rather difficult, and almost impossible during the periods of drought (Jun/Nov). Therefore, riparian population, naturally settled further to the North, in the State of Amazonas (Apuí) where the river is navigable and higher. This explains the isolation, until that date (1975), of the 400,000 hectares area.

(III) The so-called Forest People, known in Acre and in Amazonas, are mostly the remaining rubber tappers from the rubber boom occurred at the beginning of last century. The woods from this region of Colniza, do not count on Pará rubber trees in a number which is commercially

sustainable. This fact explains why there are no forest people in the place where the colonization Project was developed.

For these reasons, considering that there would not cause any cultural impact or conflict in the possession of the offered lots, during the 80's and 90's the National Institute for Colonization and Agrarian Reform (INCRA) and the Institute of Territories of the State of Mato Grosso (INTERMAT), chose part of this area to resettle new immigrants from other parts of the country.

On the other hand, exactly for these people not being used and lacking knowledge of how to live with and manage the Amazon forest, is that the rampant deforestation began. They were seeking (i) easy profit with the sale from the wood (ii) to create conditions for their own subsistence through agriculture/ livestock, without exploring from the forest the benefits which it could have provided them.

This was the beginning of the invasions process and of total lack of control of the region, which resulted in the current environmental chaos.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.



**MINISTÉRIO DO DESENVOLVIMENTO AGRÁRIO - MDA
INSTITUTO NACIONAL DE COLONIZAÇÃO E REFORMA AGRÁRIA - INCRA
CERTIFICADO DE CADASTRO DE IMÓVEL RURAL - CCIR
EMIÇÃO 2006 / 2007 / 2008 / 2009**

PÁG.: 1 / 1

DADOS DO IMÓVEL RURAL					
CÓDIGO DO IMÓVEL RURAL 901.016.054.461-7	DENOMINAÇÃO DO IMÓVEL RURAL FAZENDA FLORESTAL SANTA MARIA				
ÁREA TOTAL(ha) 71.713,9000	CLASSIFICAÇÃO FUNDIÁRIA GRANDE PROPRIEDADE PRODUTIVA	DATA DA ÚLTIMA ATUALIZAÇÃO 31/03/2008	Nº CERTIFICAÇÃO PLANTAMEMORIAL 0		
INDICAÇÕES PARA LOCALIZAÇÃO DO IMÓVEL RURAL MARGEM DIREITA RIO ARIPUANA NORTE		MUNICÍPIO SEDE DO IMÓVEL RURAL COLNIZA		UF MT	
MÓDULO RURAL(ha) 102,2149	Nº MÓDULOS RURAIS 140,32	MÓDULO FISCAL(ha) 100,0000	Nº MÓDULOS FISCAIS 717,1390	FMP(ha) 4,0000	
SITUAÇÃO JURÍDICA DO IMÓVEL RURAL (ÁREAS REGISTRADAS)					
MUNICÍPIO DO CARTÓRIO CUIABÁ	DATA REGISTRO 02/06/2005	OFÍCIO 6º	MATRÍCULA 73958	REGISTRO R-06	LIVRO OU FICHA L-2NQ
					ÁREA(ha) 71.713,9590
ÁREA DO IMÓVEL RURAL(ha)					
REGISTRADA 71.713,9590	POSSE A JUSTO TÍTULO 0,0000	POSSE POR SIMPLES OCUPAÇÃO 0,0000	ÁREA MEDIDA 71.713,9590		
DADOS DO DETENTOR(DECLARANTE)					
NOME FLORESTAL SANTA MARIA S/A					CFFICNFI 06066768/0001-44
NACIONALIDADE	CÓDIGO DA PESSOA 05.380.502-0	% DE DETENÇÃO DO IMÓVEL RURAL 100,00	TOTAL DE CONDÔMINOS DESTA IMÓVEL 0		
DADOS DE CONTROLE					
DATA DE EMISSÃO 14/12/2009	NÚMERO DO CCIR 01849562099	DATA DE GERAÇÃO DO CCIR 10/02/2010	DATA DE VENCIMENTO: 28/02/2010		
TAXA DE SERVIÇOS CADASTRAIS(R\$)					
DÉBITOS ANTERIORES 0,00	TAXA DE SERVIÇOS CADASTRAIS 528,62	VALOR COBRADO 528,62	MULTA 52,86	JUROS 5,29	VALOR TOTAL 586,77
OBSERVAÇÕES					
ESCLARECIMENTOS GERAIS					
<ol style="list-style-type: none"> ESTE CERTIFICADO É DOCUMENTO INDISPENSÁVEL PARA DESEMBOLAR, ARRENDAR, HIPOTECAR, VENDER OU PROMETER EM VENDA O IMÓVEL RURAL E PARA HOMOLOGAÇÃO DE PARTILHA IRREGULAR OU JUDICIAL "SUCESSÃO CAUSA MORTIS", DE ACORDO COM OS PARÁGRAFOS 1º E 2º DO ARTIGO 22 DA LEI 4.547/68. PROCURE O INSTITUTO NACIONAL DE COLONIZAÇÃO E REFORMA AGRÁRIA - INCRA OU A UNIDADE MUNICIPAL DE CADASTRAMENTO - UMC, PARA ATUALIZAR O SEU CADASTRO RURAL, SEMPRE QUE OCORREREM ALTERAÇÕES NO SEU IMÓVEL, SEJA POR COMRA, VENDA, PERMUTA, DOAÇÃO, ETC. OU NAS CONDIÇÕES DE UTILIZAÇÃO E EXPLORAÇÃO. AS INFORMAÇÕES DESTA CERTIFICAÇÃO SÃO EXCLUSIVAMENTE CADASTRAIS, NÃO LEGITIMAM O DIREITO DE DOMÍNIO OU POSSE, CONFORME PRECEPÇÃO DO ARTIGO 3º DA LEI 4.566/72. A TAXA DE SERVIÇOS CADASTRAIS FOI LANÇADA COM BASE NA LEI 8.949/94 E DECRETO LEI 1.999/92 A TAXA DE SERVIÇOS CADASTRAIS FOI LANÇADA COM BASE NA LEI 4.564/64, DECRETO 55.891/65, DECRETOS LEI 5745 E 1.589/62. OS INTERESSES NO CAMPO "CLASSIFICAÇÃO FUNDIÁRIA" INDICAM QUE O IMÓVEL, RURAL, NÃO ATENDE OS REQUISITOS QUE O CLASSIFICARIAM COMO PRODUTIVO, DE ACORDO COM O ESTABELECIDO NO ARTIGO 1º DA LEI 8.949/94. FMP - FRAÇÃO MÍNIMA DE PARCELAMENTO DE ACORDO COM O ESTABELECIDO NO PARÁGRAFO 1º DO ARTIGO 1º DA LEI 5.897/72. Nº CERTIFICAÇÃO PLANTAMEMORIAL CONFORME DISPOSTO NA LEI 10.267/01 E SUAS ALTERAÇÕES. 					
TAXA DE SERVIÇOS CADASTRAIS					
<ol style="list-style-type: none"> O PRESENTE DOCUMENTO NÃO POSSUI VALOR EM CASH, BANCÁRIA FEDERAL, LOTÉRIAS, QUINHÕES DOS PORTOS DE VENDA, INTERNET BANKING, AUTO ATENDIMENTO E CADA, AQUI. O USUÁRIO COM A TAXA DE SERVIÇOS CADASTRAIS NÃO QUITADA ATÉ A DATA DE VENCIMENTO DEVERÁ SER REEMBOLSADO PARA ATUALIZAÇÃO DOS CÁLCULOS DE MULTA E JUROS - LEIS 8.207/61, 8.424/64 E 8.393/91. O CCIR SÓ É VÁLIDO COM A QUITAÇÃO DA TAXA. A COBRANÇA DA TAXA DE SERVIÇOS CADASTRAIS OBEDECERÁ OS SEGUINTE CRITÉRIOS: <ol style="list-style-type: none"> IMÓVEIS CADASTRADOS NO INDIÚVILS DE 31/03/05 E OS INCLUIDOS A PARTIR DE 01/01/06, O VALOR DA TAXA REFERE-SE AOS EXERCÍCIOS DE 2006/2007/2008/2009; IMÓVEIS INCLUIDOS A PARTIR DE 01/01/06, O VALOR DA TAXA REFERE-SE AOS EXERCÍCIOS DE 2007/2008/2009; IMÓVEIS INCLUIDOS A PARTIR DE 01/01/06, O VALOR DA TAXA REFERE-SE AOS EXERCÍCIOS DE 2008/2009; IMÓVEIS INCLUIDOS A PARTIR DE 01/01/09, O VALOR DA TAXA REFERE-SE AO EXERCÍCIO DE 2009. O VALOR DE DÉBITOS ANTERIORES REFERE-SE AOS TAXAS DE EXERCÍCIOS ANTERIORES A 2006/2007/2008/2009, CUM COMPROVAÇÃO DE PAGAMENTO NÃO FOI REGISTRADA ATÉ A DATA DE EMISSÃO DESTA CERTIFICAÇÃO. 					CARIMBO DA RECEBEDORA
AUTENTICAÇÃO MECÂNICA LEFE88701032010172785001957		586,77R\$1001		Número de Autenticidade 07180.16830.06690.04367	
VIA DO DETENTOR				RUBRICA DO RESPONSÁVEL	

Figure 4. Certificate of Registration of Rural Real Estate (CCIR) issued by the Ministry of Agrarian Development (MDA) and INCRA

Table 2. The bovine cattle herd in the municipality of Colniza

Municipality = Colniza – MT							
Variable = The herd (# of heads)							
Type of herd = Bovine							
Year							
2000	2001	2002	2003	2004	2005	2006	2007
-	32,138	47,013	81,043	96,960	152,714	197,001	217,796

Source: IBGE – Municipal Livestock Survey

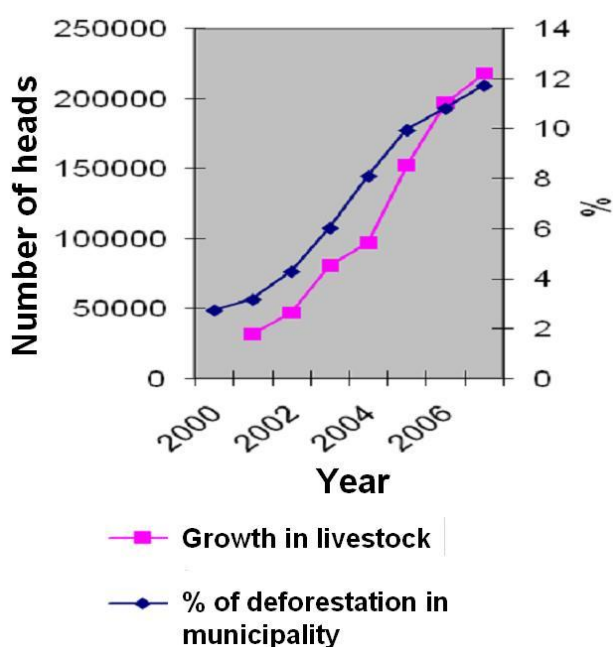


Figure 5. Comparison of the variables growth in herd and increase in deforestation, in Colniza. Source: Adapted from IBGE/PRODES (2009)

Among several operations from FSM administration to implement its Forest Stewardship Plan, a Public Hearing (*Audiência Pública*) was held in Colniza on August 27, 2002. In that period, at the highest pitch of invasions, land-grabbers alleged that the FSM farm was not productive for its whole area, and that the Forest Stewardship Plan was a pretext to hinder invasions. By recommendation and support from the State Public Ministry of Environment, this Hearing was organized, with participation of local, state, and federal authorities. The Forest Stewardship Plan was entirely presented to a 300-people audience, pointing out their social and environmental benefits. The Hearing caused an immediate positive impact; however, invasions and wood robbery from the FSM forest management activities did not cease. The FSM estate underwent successive invasions that were stopped (denouncements were registered) with subsequent land

reintegration. Registered evidences of this series of denouncements (B.O. – Police Reports) against land-grabbers and criminal organizations that issued adulterated land documents are available for consultation in internal FSM files.

The FSM farm has 7 fixed vigilance points distributed all along the property, which control all entrances and boundaries of the farm. The portion southeast of the farm is the most critical in terms of invasion risks, as several roads and trails have been made to access farm boundaries passing through INCRA settlements. All vigilance points are provided with lodgings for guards, where at least one guard (contracted by the FSM farm) keeps in charge of a certain area of forest.

The FSM farm has the largest stewardship plan licensed in the State of Mato Grosso, as shown in Figure 6. It is evident that the FSM property has played a fundamental role in the containment of deforestation in the course of these last years. However, the sustainable forest management conducted at the property is under great pressure from other economic activities conducted in the area bordering the property, related to land-grabbing and to extensive cattle-raising, in addition to the difficulties inherent to the development of forestry stewardship, currently undergoing a crisis in Brazil. Moreover, forest management itself poses several difficulties, which implicates in the economic viability of the operation. To take all the measures and steps to achieve a sound business operation, FSM has encountered challenges that indicate risks. These risks can be considered barriers to the continuation of the forest management project itself, and resources from the sales of carbon credits would be a very important component of the operation today and years to come.

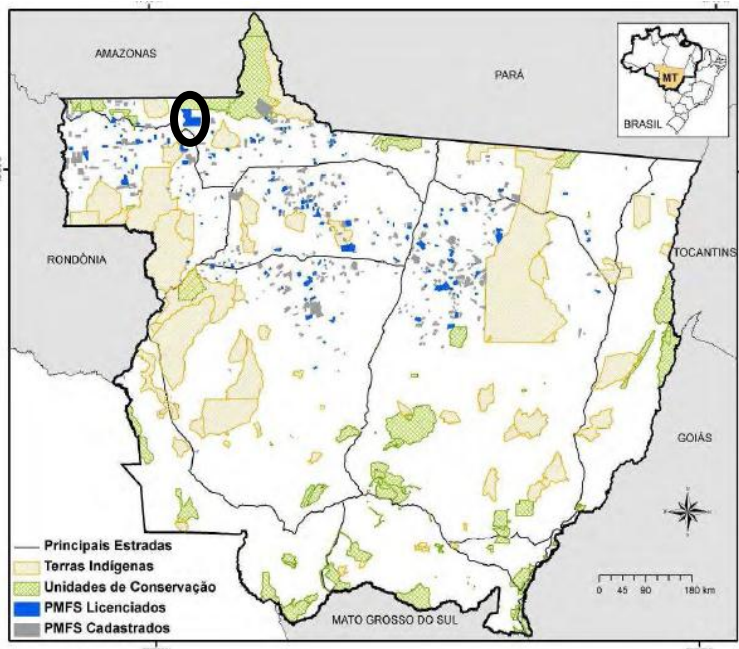


Figure 6. Sustainable Forest Stewardship Plans registered at and licensed by the Special Environmental Office (SEMA) in MT, 2007.

Generally speaking, the logging industry conducted within the framework of forest stewardship activities in the Brazilian Amazon region face serious difficulties in terms of funding and cash-flow, which includes different aspects such as legalization of property ownership, the slow pace of the environmental protection agencies responsible for issuing permits for such activities and the threat and risks associated with the history of land tenure in the region. To this, is added the blunt difficulty posed by competition with the sale of illegal wood originated from the deforestation in grabbed lands or from areas without logging permits.

Cattle-raising in the Amazon region, on the other hand, has become an extremely lucrative activity, particularly when carried out as a result of illegal deforestation (which comprehends the vast majority of the cases). This is a result of low cost of land, greater productivity and the generation of capital from a preliminary exploitation of wood. Cattle-ranching thrives also thanks to a good distribution of rainfall, the absence of frost and the natural fertility of soils in recent deforested areas. Furthermore, the profitability of cattle-raising is further leveraged by the abundant availability of subsidized rural credit lines, e.g. those provided by the Constitutional Fund for the Financing of the Northern Region (FNO/FCO), which become additional benefits in large operations.

Therefore, the ongoing activities of forest stewardship through logging management at FSM farm requires the supplementation of this activity with income arising from the payment for environmental services (by valuating the services for keeping the forest standing) which, at this point, is only available through mechanisms derived from the UNFCCC and Voluntary Carbon Markets, within the emerging concepts of REDD.

It is clear that the FSM farm will not be able to afford large long-term costs and efforts for vigilance of land property. In this context, the FSM farm baseline may involve the following non-excluding baseline scenarios:

Scenario 1: deforestation and logging of the area permitted by Law, to generate supplementary incomes to financially support long-term vigilance system; this would correspond to active deforestation of the property by land owner in the future;

Scenario 2: adoption of common land-use practices in the region (business as usual - BAU), including deforestation beyond limits established by Brazilian Forest Code (generalized non-compliance, typically observed in the farm region); this would be the probable scenario if no additional environmental values are attributed to the operation;

Scenario 3: unplanned deforestation caused by uncontrolled invasions, derived from the lack of ability to control borders in case of the current cash-flow scenarios with logging operations alone, which indicates the need for additional sources of income in the overall operation of FSM;

Scenario 4: farm sale to private investors (in this case, the regional BAU is probably the most plausible future scenario). In recent years, FSM owners have already been approached to sell the FSM farm (some offers are documented). According to FSM, a group of European investors, represented by a local sawmill, made a credible offer to

purchase the property. The investors propose to log and process timber from the FSM forest, whose production would be exported to the European market. Registered evidences of the interest of FSM land purchase (e.g. purchase proposals) are available for consultation by auditors. All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

1.2 Sectoral Scope and Project Type

- Sectoral Scope: 14 - Agriculture Forestry and Other Land Use
- AFOLU – REDD - Avoiding Unplanned Deforestation and Degradation (AUDD)
- This is not a Grouped project.

1.3 Project Proponent

Land Ownership:

Florestal Santa Maria S.A.

Rua Augusta, 2883, Cj. 62, 6º andar / São Paulo, SP, CEP: 01413-100

Represented by: Rubens Forbes Alves de Lima - rubens@florestalsantamaria.com.br

Marcelo Martins Lunardelli - mml@florestalsantamaria.com.br

1.4 Other Entities Involved in the Project

Technical Advisory:



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Represented by: Warwick do Amaral Manfrinato - warwick@manfrinato.com.br

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Bunge Emissions Group www.bunge.com

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AVIX Geo Ambiental (Similarity Analysis and Deforestation Risk Analysis)

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Legal Advisory:

PINHEIRONETO
ADVOGADOS



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Project Coordination and Advice to FSM:VO2 Desenvolvimento Empresarial

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1.5 Project Start Date

Project start date: April 13, 2009 (Date on which first money transfer was made to K2C consultancy and the participants started to work on the project development.) This document is available for consultation by auditors. All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

1.6 Project Crediting Period

Start date: April 13, 2009

End date: April 13, 2039

Total number of years: 30 years

1.7 Project Location

Country: Brazil

State: Mato Grosso

Municipality: Colniza

Project boundary coordinates (meters; SAD69):

UTM 21

0237843	8972335
0233198	9004336
0252337	8987942
0271190	8988449
0269828	8972729

1.8 Title and Reference of Methodology

Approved VCS Methodology **VM0007 Version 1.1**

7 September 2011 REDD Methodology Module

“REDD Methodology Framework (REDD-MF)”

Sectoral Scope 14, from Avoided Deforestation Partners (ADP).

This REDD Methodology Framework provides guidance for constructing methodologies for REDD project activities compliant with the validation and verification requirements of the VCS. By using this document, a REDD methodology was constructed based on a set of pre-defined VCS-approved modules. The resulting methodology is VCS-approved without the requirement of a methodology validation.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

- The FSM team is currently negotiating with neighbors and public entities to enhance the vigilance mechanisms on the farm frontiers. The implementation of these improved mechanisms is dependent on VCU benefits. The FSM team is also articulating the implementation of the activities foreseen in Annex 1 of the VCS-PD. The implementation of the Annex 1 activities is also dependent on VCU revenues.
- The FSM farm is continually avoiding invasions by means of its vigilance bases, as described in the VCS-PD. The FSM team is also currently making efforts to obtain the FSC (Forest Stewardship Council) certification, to guarantee that sustainable forest management is being carried out according to the best practices. These activities have already been attested during the validation field audit process.
- As stated in the VCS-PD, the project proponent believes that Annex 1 activities, to be implemented with VCS revenues, will be an efficient mechanism to avoid or reduce leakage to levels below the 10% adopted in VCS-PD estimates.

2.2 Deviations from the Monitoring Plan

The areas exploited inside the FSM farm from 13rd April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. The documents showing the areas exploited within this time period are available for consultation by auditors and will be kept in a secure retrievable manner for at least two years after the end of the project crediting period. Thus, the baseline emissions and project emissions occurring inside these areas were not quantified for the present verification period.

2.3 Grouped Project

Not applicable: this is not a grouped project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	CF
Data unit:	tCt d.m ⁻¹
Description:	Carbon fraction of dry matter in t Ct-1 d.m.
Source of data:	Values from the literature (e.g. IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3) shall be used if available, otherwise default value of 0.47 t C t-1 d.m. can be used
Value applied:	0.47
Purpose of the data:	The default value was used to be more conservative
Any comment:	Where new species are encountered in the course of monitoring, new carbon fraction values must be sourced from the literature or otherwise use the default value.

Data Unit / Parameter:	R
Data unit:	t root d.m.t ⁻¹ shoot d.m.
Description:	Root to shoot ratio appropriate to species or forest type / biome; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area: aboveground biomass per

	unit area (not on a per stem basis)
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4.
Value applied:	0.37
Purpose of the data:	Local values are not known, and the IPCC factor is a conservative value.
Any comment:	<p>Guidelines for Conservative Choice of Default Values:</p> <p>Global values may be selected from Table 4.4 (modified as given above) of the AFOLU Guidelines (IPCC 2006), by choosing a climatic zone and forest type that most closely matches the project circumstances.</p>

Data Unit / Parameter:	$\ln(\text{Volume, m}^3) = -8.939 + 2.507 \cdot \ln(\text{DBH, cm})$
Data unit:	$\text{m}^3 \cdot \text{tree}^{-1}$
Description:	Allometric equation to estimation of aboveground merchantable volume of trees, in the range between 4.46-cm and 81.99-cm DBH.
Source of data:	<p>Peer-reviewed scientific article:</p> <p>NOGUEIRA, E.M.; FEARNESIDE, P.M.; NELSON, B.W.; BARBOSA, R.I.; KEIZER, E.W.H., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256(2008): 1853-1867.</p>
Value applied:	$\ln(\text{Volume, m}^3) = -8.939 + 2.507 \cdot \ln(\text{DBH, cm})$
Purpose of the data:	The result of such equation must be converted to mass by multiplying it by the wood density
Any comment:	Peer-reviewed work performed in the region of FSM farm, with a similar vegetation typology. The statistical quality of model is in conformance with methodology requirements.

Data Unit / Parameter:	$\text{Volume, m}^3 = -0.4306 + 0.0011 \cdot (\text{DBH, cm})^2$
Data unit:	$\text{m}^3 \cdot \text{tree}^{-1}$

Description:	Allometric equation to estimation of aboveground merchantable volume of trees with DBH higher than 82 cm.
Source of data:	Peer-reviewed scientific article: COLPINI, C.; TRAVAGIN, D.P.; SOARES, T.S.; SILVA, V.S.M. e, 2009. Determinação do volume, do fator de forma e da porcentagem de casca de árvores individuais em uma Floresta Ombrófila Aberta na região noroeste de Mato Grosso. Acta Amazonica, 39(1): 97-104.
Value applied:	Volume, m ³ = -0.4306 + 0.0011*(DBH, cm) ²
Purpose of the data:	The result of such equation must be converted to mass by multiplying it by the wood density
Any comment:	Peer-reviewed work performed in the region of FSM farm, with a similar vegetation typology. The statistical quality of model is in conformance with methodology requirements.

Data Unit / Parameter:	$\ln(\text{Mass, kg}) = -6.3789 - 0.877 \cdot \ln(1/(\text{DBH, cm})^2) + 2.151 \cdot \ln(\text{Height, m})$
Data unit:	kg.tree ⁻¹
Description:	Allometric equation to estimation of total aboveground biomass of palms.
Source of data:	Peer-reviewed scientific article: SALDARRIAGA, J.G., WEST, D.C., THARP, M.L., UHL, C., 1988. Long-term chronosequence of forest succession in the upper Rio Negro of Colombia and Venezuela. Journal of Ecology, 76: 938–958.
Value applied:	$\ln(\text{Mass, kg}) = -6.3789 - 0.877 \cdot \ln(1/(\text{DBH, cm})^2) + 2.151 \cdot \ln(\text{Height, m})$
Purpose of the data:	The result of such equation must be divided by 1000 to obtain the biomass value in t.
Any comment:	Peer-reviewed work. The statistical quality of model is in conformance with methodology requirements.

3.2 Data and Parameters Monitored

In a conservative approach, the project proponent opted not to monitor forest degradation in the Reference Area and Project Area. According to previous studies for characterization of the Reference Area, illegal extraction of smaller trees for fuelwood and charcoal is not a usual practice in the FSM region. Moreover, the practice of illegal logging of smaller trees and forest degradation is expected to be pretty much more pronounced in non-protected areas, as those observed in the Reference Area, than in protected forest areas, as the FSM farm. As demonstrated in the VCS-PD, the FSM farm has a system for monitoring boundaries and for hindering any invasion that might endanger the forest. The only carbon loss inside the FSM farm is attributed to low-impact Sustainable Forest Management. The forest management performed inside the FSM farm is currently being evaluated and improved to receive the FSC certification in 2012. The emissions occurring from Sustainable Forest Management (logging gaps, roads, and decks) will be continuously monitored and reported by the project proponent during the entire project period.

Data Unit / Parameter:	Project Forest Cover Monitoring Map
Data unit:	N/A
Description:	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, the benchmark map must show the deforested areas at each monitoring event
Source of data:	Remote sensing in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied:	The measurement methods and procedures applied are described in Approved VCS Module VMD0015 (Version 2.0) REDD Methodological Module: Methods for monitoring of greenhouse gas emissions and removals (M-MON), Sectoral Scope 14, pages 3 to 14.
Frequency of monitoring/recording:	At least every 5 years or if verification occurs on a frequency of less than every 5 years, examination must occur prior to any verification event
Value monitored:	N/A
Monitoring equipment:	Remote sensing and GPS

QA/QC procedures to be applied:	The minimum map accuracy should be 90% for the classification of forest/non-forest in the remote sensing imagery. If the classification accuracy is less than 90% then the map is not acceptable for further analysis. More remote sensing data and ground truthing data will be needed to produce a product that reaches the 90% minimum mapping accuracy.
Calculation method:	N/A
Any comment:	-

Data Unit / Parameter:	Leakage Belt Forest Cover Monitoring Map
Data unit:	N/A
Description:	Map showing the location of forest land within the leakage belt area at the beginning of each monitoring period.
Source of data:	Remote sensing in combination with GPS data collected during ground truthing
Description of measurement methods and procedures to be applied:	Map accuracy is 90%
Frequency of monitoring/recording:	At least every 5 years or if verification occurs on a frequency of less than every 5 years, examination must occur prior to any verification event
Value monitored:	N/A
Monitoring equipment:	Remote sensing and GPS
QA/QC procedures to be applied:	N/A
Calculation method:	N/A
Any comment:	-

Data Unit / Parameter:	$A_{burn,i,t}$
Data unit:	ha
Description:	Area burnt in stratum i at time t
Source of data:	Remote sensing data
Description of measurement methods and procedures to be applied:	It is considered that burning is a common practice in the region, and that all deforested area undergoes burning in a given moment.

Frequency of monitoring/recording:	Areas burnt will be monitored every 5 years or if verification occurs on a frequency of less than every 5 years, examination will occur prior to any verification event
Value monitored:	This value varies annually, as a function of deforested area.
Monitoring equipment:	Remote sensing
QA/QC procedures to be applied:	Best practices in remote sensing
Calculation method:	N/A
Any comment:	As burning of biomass is common practice in the region, it was considered that all the deforested areas were burnt – deforestation cycle includes burning.

Data Unit / Parameter:	$A_{DefPA,i,t}$
Data unit:	Ha
Description:	Area of recorded deforestation in the project area in stratum i at time t
Source of data:	Remote sensing imagery
Description of measurement methods and procedures to be applied:	Remote sensing tools
Frequency of monitoring/recording:	Monitored every 5 years or if verification occurs on a frequency of less than every 5 years, examination will occur prior to any verification event
Value monitored:	Set to zero
Monitoring equipment:	Remote sensing
QA/QC procedures to be applied:	Best practices in remote sensing
Calculation method:	-
Any comment:	Ex-ante, an estimation of deforestation in the with-project case. The belief is that zero degradation will occur within the project boundaries then this parameter is set to zero, clear infrastructure, hiring and policies are in place to prevent deforestation.

Data Unit / Parameter:	$A_{DefLB,i,t}$
Data unit:	Ha

Description:	Area of recorded deforestation in the leakage belt in stratum i at time t
Source of data:	Remote sensing imagery
Description of measurement methods and procedures to be applied:	Periodic analysis of remote sensing imagery
Frequency of monitoring/recording:	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event.
Value monitored:	To be determined ex-post
Monitoring equipment:	Satellite imagery
QA/QC procedures to be applied:	Best practices in remote sensing
Calculation method:	Periodic analysis of the progression of deforested area in Leakage belt
Any comment:	-

Data Unit / Parameter:	$A_{RRL,forest,t}$
Data unit:	Ha
Description:	Remaining area of forest in RRL at time t
Source of data:	Remote sensing imagery
Description of measurement methods and procedures to be applied:	Periodic analysis of the progression of deforested area in RRL
Frequency of monitoring/recording:	Monitored every 5 years or if verification occurs on a frequency of less than every 5 years, examination will occur prior to any verification event
Value monitored:	To be determined ex-post
Monitoring equipment:	Remote sensing imagery
QA/QC procedures to be applied:	Best practices in remote sensing
Calculation method:	Analysis of satellite images
Any comment:	Ex-ante, estimation shall be made of likely deforestation in the with-project case.

Data Unit / Parameter:	A_{sp}
Data unit:	ha
Description:	Area of sample plots in ha
Source of data:	Recording and archiving of number and size of

	sample plots
Description of measurement methods and procedures to be applied:	Identify how the data/parameter is measured
Frequency of monitoring/recording:	At least every ten years for baseline renewal. Where carbon stock enhancement is included, monitoring shall occur at least every five years
Value monitored:	0.025 ha
Monitoring equipment:	GPS and measuring tape
QA/QC procedures to be applied:	GPS coordinates are double checked in the field
Calculation method:	N/A
Any comment:	Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known <i>ex-ante</i> . Where part of project monitoring, <i>ex-ante</i> the number and area of sample plots shall be estimated based on projected sample effort relative to projections of growth and emissions.

Data Unit / Parameter:	N
Data unit:	Dimensionless
Description:	Number of sample plots
Source of data:	Recording and archiving of number of sample points
Description of measurement methods and procedures to be applied:	Calculated with formula
Frequency of monitoring/recording:	At least every ten years for baseline renewal. Where carbon stock enhancement is included, monitoring shall occur at least every five years.
Value monitored:	128
Monitoring equipment:	N/A
QA/QC procedures to be applied:	-
Calculation method:	Calculated using the following formula: $n = (t^2 \cdot CV^2) / (E\%^2 + ((t^2 \cdot CV^2) / N))$ <p>Where n = number of parcels sampled in each stratum (variable for each stratum) t = Student "t" value (2.262) CV = coefficient of variation (%) (variable for each stratum) E% = permissible sampling error (10%) N = number of parcels in total stratum area (variable for each</p>

	stratum) Figures used for each variable in each stratum are available for consultation by auditors.
Any comment:	-

Data Unit / Parameter:	DBH
Data unit:	Cm
Description:	Diameter at breast height of a tree in cm
Source of data:	Field measurements in sample plots
Description of measurement methods and procedures to be applied:	Measured 1.3m above ground. Measure all trees above some minimum DBH in the sample plots. The minimum DBH varies depending on tree species and climate; for instance, the minimum DBH may be as small as 2.5 cm or as high as 20m. Minimum DBH employed in inventories is held constant for the duration of the project.
Frequency of monitoring/recording:	Monitoring must occur at least every ten years for baseline renewal. Where carbon stock enhancement is included, monitoring shall occur at least every five years.
Value monitored:	-
Monitoring equipment:	Measuring tape
QA/QC procedures to be applied:	Standard quality control procedures for forest inventory including field data collection and data management were applied. The procedure of DBH measurement is already applied in national forest monitoring, and is available from published handbooks, and from the IPCC GPG LULUCF 2003. An example of handbook is MacDicken, K.G. (1997) A Guide to Monitoring Carbon Storage in Forestry and Agroforestry Projects. Winrock International Institute for Agricultural Development. 91 pp.
Calculation method:	Diameter (DBH) is calculated based on circumference at breast height (CBH) measurement, by means of the basic perimeter equation: $CBH = \pi \times DBH$
Any comment:	-

Data Unit / Parameter:	H
Data unit:	M
Description:	Total height of tree
Source of data:	Field measurements in sample plots
Description of measurement methods and procedures to be applied:	Direct measurement by means of hypsometer
Frequency of monitoring/recording:	Monitoring must occur at least every ten years for baseline renewal. Where carbon stock enhancement is included, monitoring shall occur at least every five years.
Value monitored:	-
Monitoring equipment:	Hypsometer
QA/QC procedures to be applied:	-
Calculation method:	N/A
Any comment:	<p>Where carbon stock estimation occurs only for determination of the baseline this parameter shall be known ex-ante. Where part of project monitoring, ex-ante height shall be estimated based on projections of growth.</p> <p>Direct measurement of height corresponding merchantable value.</p> <p>This parameter is only used in allometric equations of palms. For trees, this parameter is only applied for cross-checking of data obtained in the field. In this latter case, the measurement can be performed visually, after training.</p>

Data Unit / Parameter:	A_{DECKS,t}
Data unit:	Ha
Description:	Area of logging decks in stratum i at time t
Source of data:	Reported measurements such as post-harvest assessment reports and post-harvest maps that are based on field measurements
Description of measurement methods and procedures to be applied:	Systematic sampling must take place to ensure all decks within the area logged are identified and a conservative estimate of area produced.
Frequency of monitoring/recording:	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event

Value monitored:	<i>2.71 hectares of open area for each 1,000 hectares of net logging gap area</i>
Monitoring equipment:	Data obtained from annual FSM forest management (logging gap: UPA 24) and reports
QA/QC procedures to be applied:	The measured area of logging decks in current logging gaps will be compared with those of previous logging gaps
Calculation method:	Ex-ante, estimations of emissions from deck creation shall be based on logging management plans or average size of decks and number of decks produced due to logging in the farm
Any comment:	Data obtained from annual FSM forest management (logging gap: UPA 24)

Data Unit / Parameter:	$A_{ROAD,i,t}$
Data unit:	Ha
Description:	Area of roads in stratum i at time t
Source of data:	Reported measurements such as post-harvest assessment reports and post-harvest maps that are based on field measurements
Description of measurement methods and procedures to be applied:	<p>The area of roads created may be based on the length of roads multiplied by the average width of roads. The length of all roads created during selective logging must be measured through systematically sampling the entire area logged to produce a conservative estimate of the length of roads created.</p> <p>Sufficient number of measurements of road width shall be measured to achieve a precision of equal or less than 15% of the mean at the 95% confidence interval. Where different categories of roads exist, different average road widths should be used.</p>
Frequency of monitoring/recording:	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored:	<i>6.42 hectares of open area for each 1,000 hectares of net logging gap area</i>
Monitoring equipment:	Data obtained from annual FSM forest management (logging gap: UPA 24) and reports

QA/QC procedures to be applied:	The measured area of roads in current logging gaps will be compared with those of previous logging gaps
Calculation method:	Ex-ante, estimations of emissions from road creation shall be based on logging management plans or average width of roads and length of roads produced for logging in the farm
Any comment:	Data obtained from annual FSM forest management (logging gap: UPA 24)

Data Unit / Parameter:	L_{sk}
Data unit:	m
Description:	Length of skid trail sk
Source of data:	Reported measurements such as post-harvest assessment reports and post-harvest maps that are based on field measurements
Description of measurement methods and procedures to be applied:	The length of skid trails may be estimated through using systematic sampling with a random start of the entire area logged or within a sampled known logged area within the project boundary to produce a conservative estimate of the length of skid trails created. The total length of all skid trails can be equal to the mean length of skid trails per unit area multiplied by the total area logged.
Frequency of monitoring/recording:	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value monitored:	<i>03 skid trails for each logging deck; each skid trail is estimated to be 250-m long in average</i>
Monitoring equipment:	Data obtained from annual FSM forest management (logging gap: UPA 24) and reports
QA/QC procedures to be applied:	The measured length of skid trails in current logging gaps will be compared with those of previous logging gaps
Calculation method:	Ex-ante, estimations of emissions from skid trail creation shall be based on logging management plans or average length and number of skid trails produced due to logging in the farm
Any comment:	Data obtained from annual FSM forest

	management (logging gap: UPA 24)
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Data Unit / Parameter:	W_{SKID}
Data unit:	m
Description:	Mean width of skid trails
Source of data:	Reported measurements such as post-harvest assessment reports and post-harvest maps that are based on field measurements
Description of measurement methods and procedures to be applied:	The average width of skid trails created within a stratum i can be based on reported widths; a conservative estimate based on machinery used; or additional field measurements. Conservative estimate: Width edge of tires on largest skidder type * 140% is used, as the skidder type is known and used to create all skid trails.
Frequency of monitoring/recording:	The estimated mean width of skid trails shall be monitored and updated prior to each verification report.
Value monitored:	2,6 m * 1,4
Monitoring equipment:	Data obtained from annual FSM forest management (logging gap: UPA 24) and reports
QA/QC procedures to be applied:	The width of skid trails in current logging gaps will be compared with those of previous logging gaps
Calculation method:	Conservative estimate: Width edge of tires on largest skidder type * 140% is used, as the skidder type is known and used to create all skid trails.
Any comment:	It is assumed that all diameter trees are destroyed and therefore the aboveground and belowground tree biomass that is destroyed by the skidder conservatively equates to the maximum aboveground biomass carbon stock observed in all strata. Based on the overall area of skid trails related to the Project Area, the values estimated for emissions from skid trails are not significant according to T-SIG, as they represent much less than 5% of total emissions. Thus, the inclusion of these emissions in final calculations is indisputably conservative <i>per se</i> .

Data Unit / Parameter:	A_i										
Data unit:	ha										
Description:	Total area of stratum <i>i</i>										
Source of data:	GPS delineation and remote sensing imagery										
Description of measurement methods and procedures to be applied:	GPS delineation and remote sensing imagery										
Frequency of monitoring/recording:	At a minimum every time the baseline is updated (at least every 10 years)										
Value monitored:	<table border="1"> <thead> <tr> <th>Stratum</th> <th>Area (ha)</th> </tr> </thead> <tbody> <tr> <td>Aluvial</td> <td>13,131.60</td> </tr> <tr> <td>Encosta</td> <td>9,288.30</td> </tr> <tr> <td>FOB Densa Submontana</td> <td>6,721.00</td> </tr> <tr> <td>FOB Submontana Cipós e Palmeiras</td> <td>42,573.00</td> </tr> </tbody> </table> <p>The areas exploited inside the FSM farm from 13rd April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. The documents showing the areas exploited within this time period are available for consultation by auditors and will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.</p>	Stratum	Area (ha)	Aluvial	13,131.60	Encosta	9,288.30	FOB Densa Submontana	6,721.00	FOB Submontana Cipós e Palmeiras	42,573.00
Stratum	Area (ha)										
Aluvial	13,131.60										
Encosta	9,288.30										
FOB Densa Submontana	6,721.00										
FOB Submontana Cipós e Palmeiras	42,573.00										
Monitoring equipment:	GPS and satellite image										
QA/QC procedures to be applied:	GPS data is confirmed by field survey.										
Calculation method:	Satellite image analysis										
Any comment:	Ex-ante it shall be assumed that strata area will remain constant										

Data Unit / Parameter:	$V_{ex,i}$
Data unit:	m ³
Description:	The volume of timber in m ³ extracted from within the stratum (does not include slash left onsite),

	reported by wood product class and preferably species.
Source of data:	Timber harvest records
Description of measurement methods and procedures to be applied:	Timber inventory, performed in FSM
Frequency of monitoring/recording:	Annually
Value monitored:	FSM controls all the timber extracted from the management area. Volumes are recorded annually. Data is available for auditors.
Monitoring equipment:	The same equipment applied in forest inventory
QA/QC procedures to be applied:	The same control procedures applied to forest inventory
Calculation method:	Timber inventory
Any comment:	Note that this volume does not include logging slash left onsite. Data compilers should also make sure that extracted volumes reported are gross volumes removed (i.e. reported volume does not already discount for estimated wood waste, as is often the practice in harvest records). Assignment of volume extracted to wood product class(es), will be substantiated on the basis of records of timber sales.

3.3 Description of the Monitoring Plan

Title and reference of the VCS methodology

Approved VCS Module VMD0015 - Version 2.0

REDD Methodological Module:

Methods for monitoring of greenhouse gas emissions and removals (M-MON)

Sectoral Scope 14

These methods aim at monitoring changes in land cover due to deforestation and carbon stock enhancement, and to calculate activity data for each of these categories of change. These methods are applied for monitoring Reference Area, Project Area and Leakage Belt.

In a conservative approach, the project proponent opted not to monitor forest degradation in the Reference Area and Project Area. According to previous studies for characterization of the Reference Area, illegal extraction of smaller trees for fuelwood and charcoal is not a usual practice in the FSM region. Moreover, the practice of illegal logging of smaller trees and forest

degradation is expected to be pretty much more pronounced in non-protected areas, as those observed in the Reference Area, than in protected forest areas, as the FSM farm. As demonstrated in the VCS-PD, the FSM farm has a system for monitoring boundaries and for hindering any invasion that might endanger the forest. The only carbon loss inside the FSM farm is attributed to low-impact Sustainable Forest Management. The forest management performed inside the FSM farm is currently being evaluated and improved to receive the FSC certification in 2012. The emissions occurring from Sustainable Forest Management (logging gaps, roads, and decks) will be continuously monitored and reported by the project proponent during the entire project period.

Revision of the baseline

a. Technical description of the monitoring task.

The baseline scenario will be monitored through an assessment of the driver variables and assumptions assumed by the LANDSAT 5 to project deforestation expected in the baseline scenario. These parameters will be re-validated after each baseline renewal (10 years), based on the calculation of the verified post facto baseline deforestation (in hectares) of the past 10 year period – in comparison with other location not affected by the project activities. If deforestation is verified as 10% lower or 10% higher than originally predicted, the post facto carbon baseline shall be re-adjusted using the observed values of the driver variables.

The baseline of a REDD project activity is estimated ex ante. It will be monitored in a reference area (unplanned deforestation) for the purpose of periodically adjusting the baseline. Ex-ante baseline estimations are therefore used in both the ex-ante and ex-post estimation of net carbon stock changes and greenhouse gas emission reductions.

The baseline monitoring task will be done in accordance with the following module:

Approved VCS Module VMD0007

Version 1.0

REDD Methodological Module:

Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP)

Sectoral Scope 14

Data collected

The data collected are given on the following tables:

Data Unit / Parameter:	Any spatial feature included in the spatial model that is subject to changes over time (Factor Maps)
------------------------	--

Data unit:	According to spatial feature selected
Description:	Factor Maps
Source of data:	Digital maps – Landsat5
Description of measurement methods and procedures to be applied:	Update of digital maps
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	Risk Maps
Data unit:	N/A
Description:	A Risk Map shows, for each pixel location, the risk, or “suitability”, for deforestation as a numerical scale (e.g. from 0 = minimum risk to some upper limit representing the maximum).
Source of data:	Digital maps – Landsat5
Description of measurement methods and procedures to be applied:	Update of digital maps
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	Baseline deforestation Maps
Data unit:	N/A
Description:	Maps showing the location of deforested hectares in each year of the baseline period
Source of data:	Digital maps – Landsat5
Description of measurement methods and procedures to be applied:	Update of digital maps
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	<i>AA_U</i>
Data unit:	%
Description:	The accuracy assessment of the rate of unplanned deforestation (equals 90% or more)
Source of data:	Existing maps or models, expert consultation, literature
Description of measurement methods and procedures to be applied:	Multi-criteria analysis implemented in a Geographical Information System
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	<i>Correct</i>
Data unit:	Ha
Description:	Area correct due to observed change predicted as change
Source of data:	Spatial model of deforestation location
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	<i>Err_A</i>
Data unit:	Ha
Description:	Area of error due to observed change predicted as persistence
Source of data:	Spatial model of deforestation location
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	Err_B
Data unit:	ha
Description:	Area of error due to observed persistence predicted as change
Source of data:	Spatial model of deforestation location
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	FOM
Data unit:	N/A
Description:	Figure of Merit
Source of data:	Calculated using equation $FOM = CORRECT / (CORRECT + Err_A + Err_B)$
Description of measurement methods and procedures to be applied:	Described above
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	LB
Data unit:	Ha
Description:	Leakage belt area
Source of data:	GPS coordinates and/or remote sensing data
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Where leakage belt boundaries have not been derived using GPS on-the-ground measurements, quality control shall be carried out. A minimum of 30 locations on the leakage belt boundary, each separated by at least 1km,

	shall be visited. If a systematic bias is detected in the original boundaries and/or if >10% of locations differ by >50m, then the entire boundary shall be resurveyed. These directives come from the Approved VCS Module VMD0007 (Version 1.0) REDD Methodological Module: Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP), Sectoral Scope 14.
Any comment:	Shall be estimated at time zero, this estimate shall be used for <i>ex-ante</i> purposes

Data Unit / Parameter:	LSC_{RRL}
Data unit:	Ha
Description:	The area of <i>RRL</i> suitable for conversion from forest to an alternate land use
Source of data:	Remote sensing data
Description of measurement methods and procedures to be applied:	Calculated from the result of analysis of forest areas in the reference region for projection of location of deforestation with regard to constraints to deforestation (including elevation, climate, protected status etc). Uses parameter $A_{RRL,forest,t}$ derived from M-MON
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	Monitored at least once every 10 years (when the baseline is revisited) Shall be estimated at time zero, this estimate shall be used for <i>ex-ante</i> purposes

Data Unit / Parameter:	<i>PA</i>
Data unit:	Ha
Description:	Unplanned deforestation project area
Source of data:	GPS coordinates and/or remote sensing data
Description of measurement methods and procedures to be applied:	Where project boundaries have not been derived using GPS on-the-ground, measurements quality control shall be carried out. A minimum of 30 locations on the project boundary, each

	separated by at least 1km, shall be visited. If a systematic bias is detected in the original boundaries and/or if >10% of locations differ by >50m, then the entire boundary shall be resurveyed. These directives come from the Approved VCS Module VMD0007 (Version 1.0) REDD Methodological Module: Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation (BL-UP), Sectoral Scope 14.
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	<p>Shall be estimated at time zero, this estimate shall be used for ex-ante purposes.</p> <p>The areas exploited inside the FSM farm from 13rd April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. The documents showing the areas exploited within this time period are available for consultation by auditors and will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.</p>

Data Unit / Parameter:	P_{LK}
Data unit:	Dimensionless
Description:	Ratio of the area of the leakage belt to the total area of <i>RRD</i>
Source of data:	Leakage belt area and <i>RRD</i> area, determined by satellite imaging
Description of measurement methods and procedures to be applied:	Calculated from the result of remotely sensed data analysis
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	Shall be estimated at time zero, this estimate shall be used for ex-ante purposes

Data Unit / Parameter:	$P_{LSC,RRL}$
Data unit:	Dimensionless
Description:	Ratio of the parameter LSC_{RRL} to the area of RRD
Source of data:	LSC_{RRL} area and RRD area, determined by satellite imaging
Description of measurement methods and procedures to be applied:	Calculated from the result of remotely sensed data analysis
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	Shall be estimated at time zero, this estimate shall be used for ex-ante purposes

Data Unit / Parameter:	P_{PA}
Data unit:	Dimensionless
Description:	Ratio of the project area to the total area of RRD
Source of data:	Project area and RRD area, determined by satellite imaging
Description of measurement methods and procedures to be applied:	Calculated from the result of remotely sensed data analysis
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	Monitored at least every 10 years (when the baseline is revisited) Shall be estimated at time zero, this estimate shall be used for ex-ante purposes

Data Unit / Parameter:	P_{RRL}
Data unit:	Dimensionless
Description:	Ratio of the forest area in the RRL at the start of the historical reference period to the total area of RRD
Source of data:	Forest area in the RRL and RRD , determined by satellite imaging
Description of measurement methods and	Calculated from the result of remotely sensed

procedures to be applied:	data analysis
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	Monitored at least every 10 years (when the baseline is revisited) Shall be estimated at time zero, this estimate shall be used for ex-ante purposes

Data Unit / Parameter:	<i>RRD</i>
Data unit:	Ha
Description:	Geographic boundaries of the reference area for projection of rate of deforestation
Source of data:	GPS coordinates and/or remote sensing data
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	<i>RRL</i>
Data unit:	Ha
Description:	Geographic boundaries of the reference area for projection of location of deforestation
Source of data:	GPS coordinates and/or remote sensing data
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	Best practices in remote sensing
Any comment:	-

Data Unit / Parameter:	T_{hrp}
Data unit:	Yr
Description:	Duration of the historical reference period in

	years
Source of data:	GPS coordinates and/or remote sensing data
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Updated every time the baseline is revisited (at least every 10 years)
QA/QC procedures to be applied:	N/A
Any comment:	Should be between 10 and 15 years

Monitoring of the actual carbon stock changes and greenhouse gas emissions

The implementation of the project activities will be monitored by the responsible group within FSM and will consist of large investments in policing the FSM, one monitoring base will be established in one of the already existing policing bases. All the bases communicate through radio every day to the main base.

The bases will be positioned in strategic points within the FSM and continuous monitoring activities with advanced remote sensing techniques will be implemented also satellite images and field studies will be used. The land use area monitoring will be done with remote sensing methods, using images of medium resolution, generated by INPE. Associated with this, the Environmental Monitoring Programme aims at involving the communities in mapping the threatened areas; identifying the risks and threats to which these areas are subjected. The large scale monitoring will be done through satellite images made available by INPE (PRODES).” INPE monitoring systems.

All of this reliable data that is collected and documented will be used as a technical support tool for decision making in order to improve project outcomes, and to adapt the project according to the current needs and reality. These decisions will be made during the periodic meetings to review the Activity Plan. On these occasions, the design of the Monitoring Plan will be analyzed according to its efficiency in generating reliable feedback and all the necessary information. If any changes in the Monitoring Plan or management actions are identified, a corrective action will be designed and implemented.

According to Figure 7, the red dots represent the 7 bases already established by the project owner to work as monitoring points at FSM. All the bases have radio communication and they communicate at least once a day. They are all equipped with motorcycles so they can easily move to other areas if needed.

The property management is in place and uses ABSOLUT system from SINOP applied to FSM. www.absolutsistemas.com.br

The Forestry Census is inserted into the system and it monitors every tree of the project area. The program gives support to the sustainable management plan in accordance with FSC procedures. It also complies with federal and state law.

As strategy for looking after the property and assure the project it was considered the following assumptions:

- 1-Avoid entry of outsiders:
 - 1.1 Hunters
 - 1.2 Fishermen

- 1.3 Intrusion
- 1.4 Prevention of invasion
- 1.5 Fire Prevention
- 1.6 Support the Work of Forest Stewardship Management Plan
- 2 - Consolidation of calm and peaceful possession
- 3-Cleaning of frontiers and its milestones
- 4-Internal organization of communication

On top of these issues, there is strategic plan with seven fixed bases located in strategic locations to meet the above assumptions, namely:

BASE 1 - SEDE

This base possesses the administrative office of the farm, main house (residence for Directors, Officers and invited guests), kitchen and dining hall.

This base is equipped with electricity (including a generator), satellite internet, fixed and mobile telephone (both by means of an external aerial) and a motorcycle.

BASE 2 – LINHA 12

This base possesses lodgement for collaborators, dining hall, toilets, one house for the fixed employee, building for storage and maintenance of machinery, and logging deck.

This base is equipped with electricity, mobile telephone (by means of an external aerial), and a motorcycle.

BASE 3 - ARIPUANÃ

This base possesses one house for the fixed employee, dining hall and kitchen for visitors.

This base is equipped with electricity (by means of a generator), mobile telephone (by means of an external aerial), and a motorcycle.

BASE 4 - ACAMPAMENTO

This operational base possesses three houses: two houses are lodgements with toilets and one house has a kitchen, dinning hall, storage room, office, toilets and two bedrooms.

This base is equipped with electricity (by means of a generator), and a motorcycle.

BASE 6 – LINHA 6

This base possesses a house for the fixed employee.

This base is equipped with solar electricity, and mobile telephone (by means of an external aerial).

BASE 7 - PACUTINGA

This base possesses a house for the fixed employee.

This base is equipped with solar electricity, and mobile telephone (by means of an external aerial).

BASE 8 - MORERU

This base possesses a house for the fixed employee, with accommodation for 3 people. This base is in charge of the gate to the road Colniza / Moreru.

This base is equipped with solar electricity, mobile telephone (by means of an external aerial), and a motorcycle.

All bases communicate 24 hours, the Manager of BASE 1 is authorized for any decision making and action.

BASES 2, 3 and 4 report to BASE 1

BASES 6 and 7 report to BASE 8

To be able to receive the authorization to perform a sustainable management of the forest (so called AUTEX) the property was obligated to have a sustainable management plan in place and present it to the competent environmental agency SEMA / MT. The Management Plan is fully available to auditors.

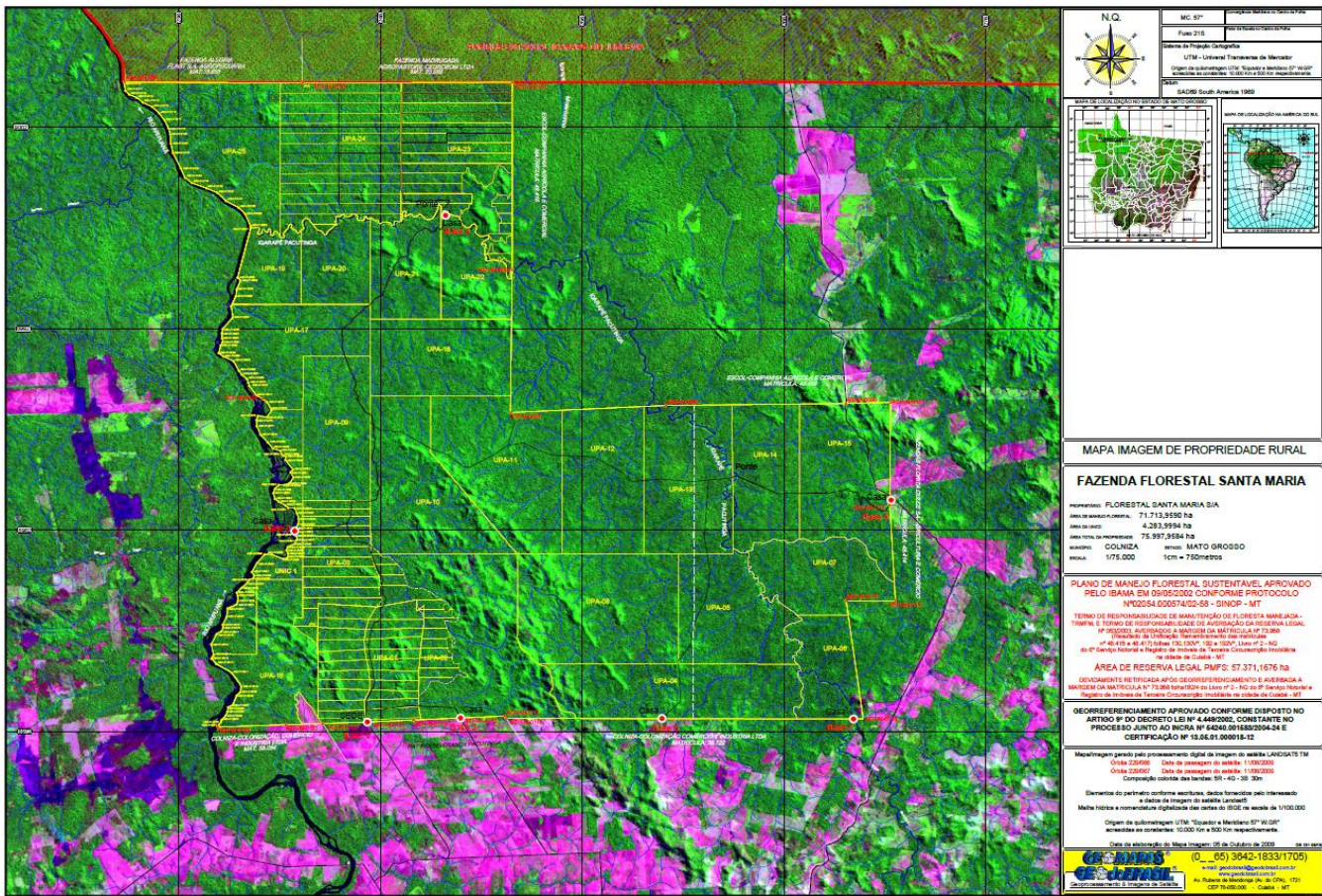


Figure 7. Distribution of the infrastructure for the project monitoring

All the parameters to be monitored are described on item 4.2 above.

Monitoring degradation due to selective logging of forest management areas

The calculation procedure for estimating net ex post emissions and removals related to selective logging activities in the project case will be equal to the summed emissions arising from selective logging operations.

The net emissions in the project case are estimated by combining:

- Emissions arising from logging gap: encompass emissions from felling timber tree and emissions from incidental damage caused by falling timber tree,
- Emissions from infrastructure: from constructing logging infrastructure for removal of timber, such as haul roads, skid trails and logging decks.

Emissions arising in the logging gap

In the project case, emissions occur as a direct result of the death of the timber tree and due to the death of trees killed when the timber tree is felled. The net emission in the project case is equal to the biomass of the wood extracted plus the logging damage factor multiplied by the extracted volume:

$$C_{LG} = \sum_{t=1}^T (C_{EXT,t} + (LDF * V_{EXT,t} * \frac{44}{12})) \tag{1}$$

Where:

- C_{LG} Actual net project emissions arising in the logging gap at time t; tCO₂-e
- $C_{EXT,t}$ Biomass carbon stock of timber extracted within the project boundary at time t; tCO₂-e
- LDF Logging damage factor; tC m⁻³
- $V_{EXT,t}$ Volume extracted at time t; m³
- t 1, 2, 3 ... t years elapsed since the start of the project activity

For ex-ante calculation of the total volume of wood extracted, it was assumed that wood extraction is always identical, independently on the type and biomass of strata. Thus, the volume of wood extracted is not dependent on strata biomass volume per hectare.

Emissions arising through logging infrastructure

The net emission in the project case is equal to the sum of emissions resulting from skid trails, roads, and logging decks created for selective logging operations.

The emissions from the creation of skid trails is estimated by multiplying the total length of skid trails created and a skid trail emission factor.

$$\Delta C_{SKID,t} = L_{SKID,t} * SK \tag{2}$$

Where:

- $\Delta C_{SKID,t}$ Change in carbon stock resulting from skid trail creation at time t; tCO₂-e
- $L_{SKID,t}$ Length of skid trails at time t; m

SK	Skid trail emissions factor (Average emissions resulting from dead wood created in the process of skid trail creation per length of skid trail); t CO ₂ -e m ⁻¹
t	1, 2, 3 ... t years elapsed since the start of the project activity

The calculation of SK is further explained in M-MON v2.0. For ex-ante calculations of emissions arising from creation of skid trails, roads, and logging decks, it was conservatively assumed the emission equivalent to the stratum with the highest biomass (i.e. "Encosta" stratum). It is assumed that the machinery used to create the skid trail kills all aboveground and belowground tree biomass located within the path of the skid trail. This biomass becomes deadwood and is assumed to be immediately emitted.

The emission resulting from the creation of roads is determined by multiplying the area of roads created by the carbon stock. The emission from logging decks is determined by measuring the area of logging decks created in each logging gap, and the area is multiplied by the carbon stock. By merging equations 17 and 18 of M-MON V2.0 (page 17), the following equation was created for estimating the emissions from roads and logging decks:

$$\Delta C_{ROAD,t+DECKS,t} = (A_{ROAD,t} + A_{DECKS,t}) * C_{BSL}$$

Where:

$\Delta C_{ROAD,t+DECKS,t}$	Change in carbon stock resulting from logging road and deck creation at time t; tCO ₂ -e
$\Delta C_{ROAD,t}$	Area of roads at time t; ha
$\Delta C_{DECKS,t}$	Area of logging decks at time t; ha
C_{BSL}	Carbon stock in aboveground and belowground tree biomass in the baseline case; tCO ₂ -e ha ⁻¹
t	1, 2, 3 ... t years elapsed since the start of the project activity

For conservativeness purposes, the biomass of the "Encosta" stratum is used in C_{BSL}, as it has the highest biomass value among all strata.

Based on the overall area of roads and logging decks related to the Project Area, the values estimated for emissions from roads and decks are not significant according to T-SIG, as they represent much less than 5% of total emissions. Thus, the inclusion of these emissions in final calculations is indisputably conservative *per se*.

Field inventory of biomass

The field inventory methodology is described in a Standard Operating Procedure (SOP), which is available for consultation by the auditors. This SOP was specifically designed to FSM carbon inventories, to be applied in the baseline assessment, as well as in the monitoring period. The field carbon inventory

involved the installation of 18 permanent transects, composed by a total of 128 permanent plots. These permanent plots will be periodically assessed throughout the project duration.

The merchantable volume of trees is estimated by directly measuring the circumference at breast height (CBH). The data of CBH is converted in DBH (Diameter at Breast Height) and applied to allometric equations for estimation of merchantable stem volume. For application of allometric equations, trees were divided in two classes of DBH:

- DBH ranging from 4.46 cm to 81.99 cm: application of allometric equation from NOGUEIRA et al. (2008);
- DBH higher than 82.00 cm: application of allometric equation from COLPINI et al. (2009);

The total aboveground tree biomass was estimated by using a default biomass expansion factor (BEF). Palm tree data underwent application of a specific allometric equation by SALDARRIAGA et al. (1988) for direct estimation of total aboveground biomass. For estimation of belowground biomass, the aboveground sum of trees and palms biomass was multiplied by a default root-shoot ratio.

The field inventory SOP (available for consultation by the auditors) describes the guidelines for the following aspects:

- Procedures for allocation of transects and plots in the field;
- Documentation of coordinates of transects and plots;
- Standards for identification and signalization of transects and plots;
- Description of field inventory team;
- Standards for measurement of tree diameters under several conditions;
- Standards for measurement dynamics of the field inventory team;
- QA/QC procedures to guarantee the application of correct field procedures (annual training, evaluation and performance reporting);
- Items for annual evaluation of field inventory team;
- QA/QC procedures to guarantee that field data are within the range of tree dimensions required in the field inventory;
- QA/QC procedures to guarantee that there was no misunderstanding in data notation in the field;
- QA/QC procedures to guarantee reliability of data transfer;
- Model of data transfer error quantification and report;
- List of equipment and materials to be used in the field inventory.

After the annual evaluation of field inventory team, the team coordinator must produce an annual Evaluation Report for each field inventory technician. This Evaluation Report will be printed in two hardcopies: one for FSM records and other for the field inventory technician that was evaluated. This document will be the evidence of the annual evaluation of field inventory team.

Monitoring of leakage carbon stock changes and greenhouse gas emissions

For the leakage belt the net greenhouse gas emissions in the project case is equal to the sum of stock changes due to deforestation in the leakage belt:

$$\Delta C_{P, LB} = \sum_{t=1}^t \sum_{i=1}^M \Delta C_{P, DefLB, i, t} \quad (4)$$

Where:

- $\Delta C_{P, LB}$ Net greenhouse gas emissions in the leakage belt in the project case; t CO_{2-e}
- $\Delta C_{P, DefLB, i, t}$ Net carbon stock change as a result of deforestation in the leakage belt the project case in stratum i at time t ; t CO_{2-e}
- i 1, 2, 3 ...M strata in the project scenario
- t 1, 3, 3, ... t^* years elapsed since the projected start of the REDD project activity

Estimation of ex-post net carbon stock changes and greenhouse gas emissions

For the project area the net greenhouse gas emissions in the project case is equal to the sum of stock changes due to deforestation and degradation plus the total greenhouse gas emissions minus any eligible forest carbon stock enhancement:

$$\Delta C_P = \sum_{t=1}^{t^*} \sum_{i=1}^M \left(\Delta C_{P, DefPA, i, t} + \Delta C_{P, Deg, i, t} + GHG_{P-E, i, t} - \Delta C_{P, Enh, i, t} \right) \quad (5)$$

Where:

- ΔC_P Net greenhouse gas emissions within the project area under the project scenario; t CO_{2-e}
- $\Delta C_{P, DefPA, i, t}$ Net carbon stock change as a result of deforestation in the project area in the project case in stratum i at time t ; t CO_{2-e}
- $\Delta C_{P, Deg, i, t}$ Net carbon stock change as a result of degradation in the project area in the project case in stratum i at time t ; t CO_{2-e}
- $GHG_{P-E, i, t}$ Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum i at time t ; t CO_{2-e}
- $\Delta C_{P, Enh, i, t}$ Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in stratum i at time t ; t CO_{2-e}
- i 1, 2, 3 ...M strata in the project scenario
- t 1, 3, 3, ... t^* years elapsed since the projected start of the REDD project activity

The net carbon stock change as a result of deforestation is equal to the area deforested multiplied by the emission per unit area.

$$\Delta C_{P,DefPA,i,t} = \sum_{n=1}^U (\Delta C_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t}) \quad (6)$$

$$\Delta C_{P,DefLB,i,t} = \sum_{n=1}^U (\Delta C_{DefLB,u,i,t} * \Delta C_{pools,P,Def,u,i,t}) \quad (7)$$

Where:

$\Delta C_{P,DefPA,i,t}$ Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t ; t CO_{2-e}

$\Delta C_{P,DefLB,i,t}$ Net carbon stock change as a result of deforestation in the project case in the leakage belt in stratum i at time t ; t CO_{2-e}

$\Delta_{DefPA,u,i,t}$ Area of recorded deforestation in the project area stratum i converted to land use u at time t ; ha

$\Delta_{DefLB,u,i,t}$ Area of recorded deforestation in the leakage belt stratum i converted to land use u at time t ; ha

$\Delta C_{pools,Def,u,i,t}$ Net carbon stock changes in all pools in the project case in land use u , in stratum i at time t ; t CO_{2-e}

u 1, 2, 3 ... U post-deforestation land uses

i 1, 2, 3 ... M strata

t 1, 3, 3, ... t^* years elapsed since the projected start of the REDD project activity

The emission per unit area is equal to the difference between the stocks before and after deforestation minus any wood products created from timber extraction in the process of deforestation:

$$\Delta C_{pools,Def,i,t} = C_{BSL,i} - C_{P,post,i} - C_{wp,i} \quad (8)$$

Where:

$\Delta C_{pools,Def,i,t}$ Net carbon stock changes in all pools as a result of deforestation in the project case in land use u in stratum i at time t ; t CO_{2-e}

$C_{BSL,i}$ Carbon stock in all pools in the baseline case in stratum i ; t CO_{2-e} ha⁻¹

$C_{P,post,i}$ Carbon stock in all pools in post deforestation land use u in stratum i ; t CO_{2-e} ha⁻¹

$C_{wp,i}$ Carbon stock sequestered in wood products from harvests in stratum i ; t CO_{2-e} ha⁻¹

u	1, 2, 3 ... U post-deforestation land uses
i	1, 2, 3 ... M strata in the project scenario
t	1, 3, 3, ... t^* years elapsed since the projected start of the REDD project activity

For calculation of carbon stock sequestered in wood products, see the module “Estimation of carbon stocks and changes in carbon stocks in the harvested wood products carbon pool in REDD project activities” (CP-W). It is conservative in the project case to assume no wood products are produced.

Instead of tracking annual emissions through burning and/or decomposition, this methodology employs the simplifying assumption that all carbon stocks are emitted in the year deforested and that no stocks are permanently sequestered (beyond 100 years after deforestation). This assumption applies regardless of whether burning is employed as part of the forest conversion process or as part of post conversion land use activities.

For each post-deforestation land use (u) estimate the long-term carbon stock. Carbon stocks in the selected pools (must be the same as those used in the baseline modules) must be measured and estimated using the methods given in module CP-AB.

$$C_{post,u,i} = C_{AB_tree,i} + C_{BB_tree,i} + C_{AB_non-tree,i} + C_{BB_non-tree,i} + C_{DW,i} + C_{LI,i} + C_{SOC,PD-BSL,i} \quad (9)$$

Where:

$C_{post,u,i}$	Carbon stock in all pools in post-deforestation land use u in stratum i at time t ; t CO _{2-e}
$C_{AB_tree,i}$	Carbon stock in aboveground tree biomass in stratum i ; t CO _{2-e} ha ⁻¹
$C_{BB_tree,i}$	Carbon stock in belowground tree biomass in stratum i ; t CO _{2-e} ha ⁻¹
$C_{AB_non-tree,i}$	Carbon stock in aboveground non-tree vegetation in stratum i ; t CO _{2-e} ha ⁻¹
$C_{BB_non-tree,i}$	Carbon stock in belowground non-tree vegetation in stratum i ; t CO _{2-e} ha ⁻¹
$C_{DW,i}$	Carbon stock in dead wood in stratum i ; t CO _{2-e} ha ⁻¹
$C_{LI,i}$	Carbon stock in litter in stratum i ; t CO _{2-e} ha ⁻¹
$C_{SOC,PD-BSL,i}$	Mean post-deforestation stock in soil organic carbon in the post deforestation stratum i ; t CO _{2-e} ha ⁻¹
u	1, 2, 3 ... U post-deforestation land uses
i	1, 2, 3 ... M strata in the project scenario

Carbon pools excluded from the project can be accounted as zero. Herbaceous non-tree vegetation is considered to be de *minimis* in all instances. For the determination which carbon pools must be included in the calculations as a minimum, use Tool T-SIG.

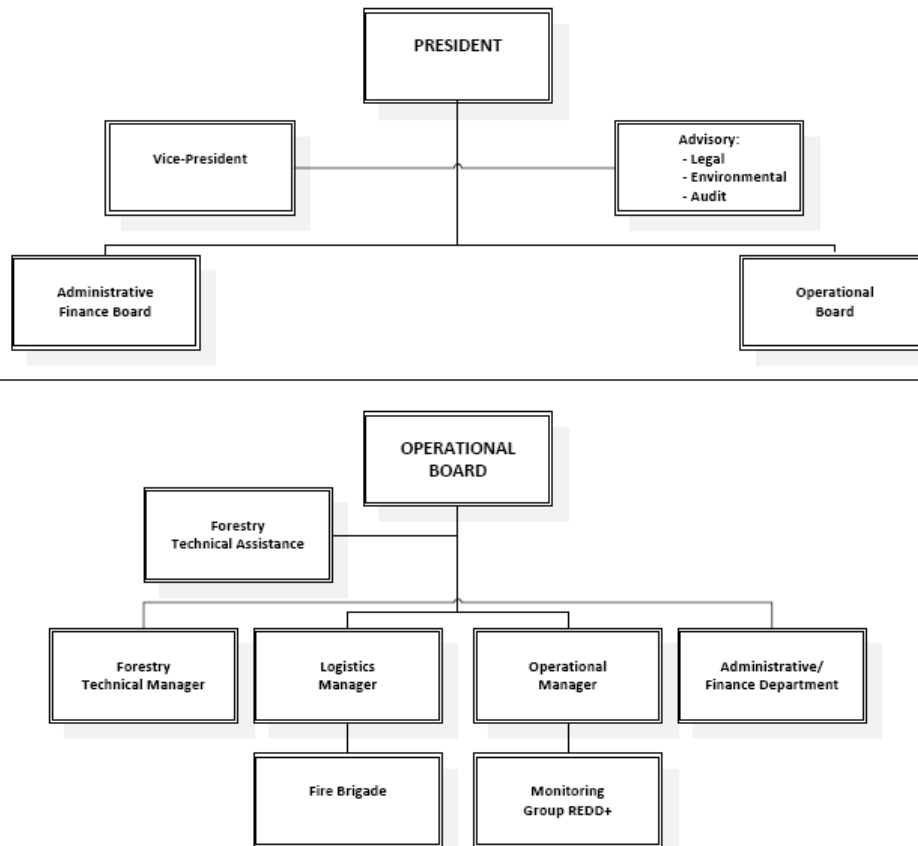
Monitoring areas undergoing carbon stock enhancement

It is conservative to assume that no carbon stock enhancement is occurring. The project elected to set $\Delta C_{P,Enh,i,t} = 0$ for the whole project area

Organizational structure, responsibilities and competencies

To ensure the operation of the monitoring activities, the operational and managerial structure will be established according to the chart below, to determine the organization and related persons in charge of data collection and archiving.

GENERAL ORGANIZATION CHART



Below the respective functions:

President: Rubens F. Alves de Lima

Vice - President: Irene Elizabeth Lenci

Advisory

Legal: LACAZ MARTINS ADVOGADOS

Environmental: PINHEIRO NETO ADVOGADOS

Audit: Moore Stephens Brasil

Administrative Finance Board: Sebastião Carvalho Vilas Boas

=====

Operational Board and Logistics Manager: Antonio Martins

Forestry Technical Assistance: SAVANA :-(savanaprojetos.com.br)

Forestry Technical Manager: Jonathan Borella

Operations Manager: Marcelo Eduardo Lopes Pereira

Project Assistant: Marta Lisli Giannichi

Administrative Finance Department: Regiane Meira da Silva

Fire Brigade: Isaque Bueno de Campos

Monitoring Group Manager: Magnon Lopes Pereira

Methods for generating, recording, aggregating, collating and reporting data on monitored parameters

The parameters monitored on the project will be generated, recorded, aggregated and collated using the system that it is already in place at FSM, “ABSOLUT Sistemas”. To ensure quality control e quality assurance FSM has implemented a controlling system where the complete forestry census is inserted into the system and it monitors every single tree. The system is already in accordance with the federal and local legislation.

Procedures for handling internal auditing and non-conformities

The procedures for handling internal auditing and non-conformities are going to be established by the Operational Board of FSM under the approval of the President. All the necessary task-force and procedures will be in place to meet the highest levels of governance.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

For conservative calculation purposes, only the areas under “Very High” and “High” deforestation risk classes were considered to be deforested in the baseline, which corresponds to a total deforestation of 87.6% of the Project Area over 30 years. Also for conservativeness purposes, the areas exploited inside the FSM farm from 13th April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. The documents showing the areas exploited within this time period are available for consultation by auditors and will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

Estimation of annual areas of unplanned deforestation

The projected unplanned baseline deforestation in the project area is estimated as follows:

$$A_{BSL,PA,unplanned,t} = A_{BSL,RRD,unplanned,t} * P_{PA}$$

Where:

$A_{BSL,PA,unplanned,t}$	Projected area of unplanned baseline deforestation in the project area in year t; ha
$A_{BSL,RRD,unplanned,t}$	Projected area of unplanned baseline deforestation in the <u>RRD</u> in year t; ha
P_{PA}	Ratio of the project area to the total area of <u>RRD</u> ; dimensionless
t	1, 2, 3, ... t years elapsed since the projected start of the REDD project activity

Future deforestation is assumed to happen first at the pixel locations with the highest deforestation risk value. In the Deforestation Risk Map, the pixels with the highest risk value were successively selected whose area is equal to the area expected to be deforested in a given project year, proportionally for a given stratum occurring in the Project Area. Pixel selection procedure was repeated for each successive project year. All yearly baseline deforestation areas were compiled in one single table showing the expected Baseline Deforestation for the Project Duration (Table 3; Location Analysis). This procedure was repeated for each forest stratum occurring in the Project Area.

Table 3. Projection of annual baseline deforestation for the Project Area (Location Analysis), during project duration, for each stratum occurring in the Project Area

Annual baseline deforestation for the Project Area							Stratum FOB Densa Submont	
	Deforestation Risk Class					Total yearly area (ha/year)	Total accumulative area (ha)	
	5	4	3	2	1			
Year								
2009	42,6					42,6	42,6	
2010	59,3					59,3	101,9	
2011	59,3					59,3	161,1	
2012	20,1					20,1	181,2	

Annual baseline deforestation for the Project Area							Stratum Encosta	
	Deforestation Risk Class					Total yearly area (ha/year)	Total accumulative area (ha)	
	5	4	3	2	1			
Year								
2009	49,8					49,8	49,8	
2010	69,3					69,3	119,1	
2011	69,3					69,3	188,5	
2012	23,5					23,5	211,9	

Annual baseline deforestation for the Project Area							Stratum Aluvial	
	Deforestation Risk Class					Total yearly area (ha/year)	Total accumulative area (ha)	
	5	4	3	2	1			
Year								
2009	355,5					355,5	355,5	
2010	495,3					495,3	850,8	
2011	495,3					495,3	1.346,1	
2012	167,8					167,8	1.514,0	

Annual baseline deforestation for the Project Area							Stratum
	Deforestation Risk Class					Total yearly area (ha/year)	Total accumulative area (ha)
	5	4	3	2	1		
Year							
2009	855,5					855,5	855,5
2010	1191,8					1.191,8	2.047,3
2011	1191,8					1.191,8	3.239,1
2012	403,8					403,8	3.642,8

Stratum
FOB Submontana Cij

Characterization of biomass in Project Area

The Project Area underwent a specific field inventory in 2010. The forest inventory was preceded by a local stratification by forest sub-types, as shown in Figure 9. Permanent sampling plots were installed in the field considering the minimal sampling for each stratum, in order to obtain a representative sample with maximum of 15% error⁸.

The field inventory methodology is described in a Standard Operating Procedure (SOP), which is available for consultation by the auditors. This SOP was specifically designed to FSM carbon inventories, to be applied in the baseline assessment, as well as in the monitoring period. The field carbon inventory involved the installation of 18 permanent transects, composed by a total of 128 permanent plots. The distribution of transects can be seen in Figure 8. The geographic coordinates of the permanent sampling plots are available for consultation by the auditors.

⁸ According to “Approved VCS Module VMD0017 (Version 1.0) REDD Methodological Module: Estimation of uncertainty for REDD project activities (X-UNC), Sectoral Scope 14”, the allowable uncertainty under this methodology is +/- 15% at the 95% confidence level. Where this precision level is met then no deduction should result for uncertainty.

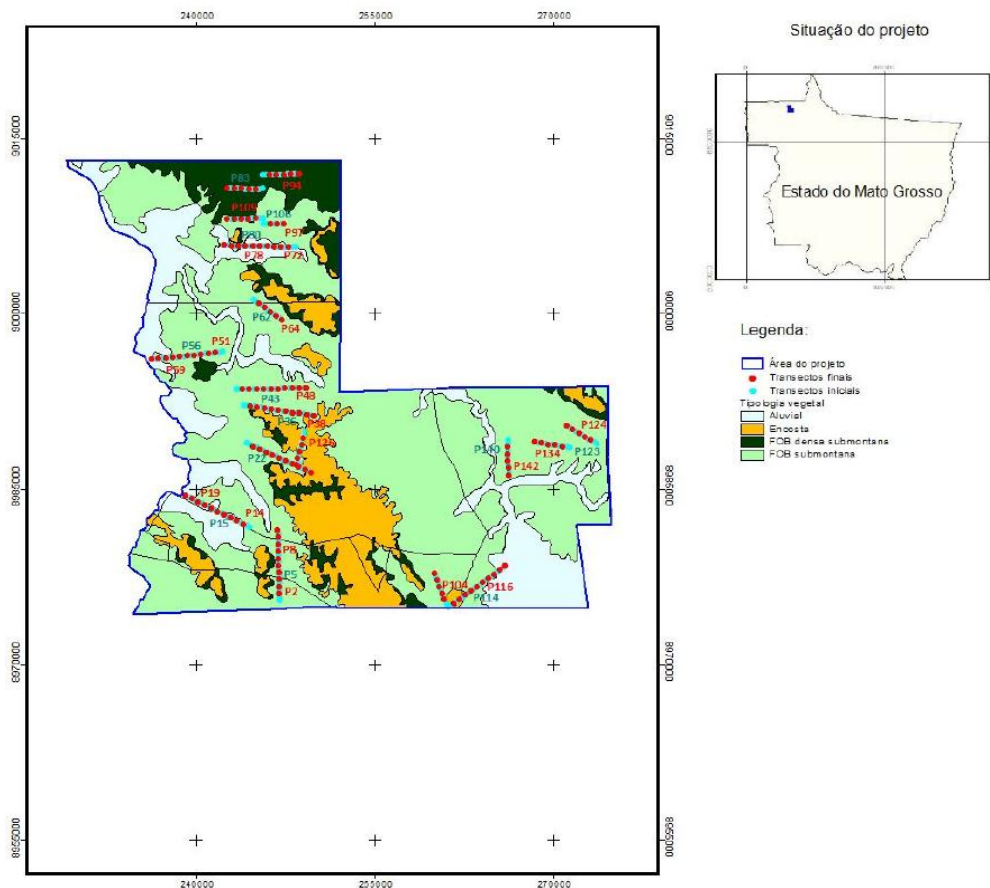


Figure 8. Distribution of permanent transects for the biomass carbon inventory in the Project Area

The merchantable volume of trees was estimated by directly measuring the circumference at breast height (CBH). The data of CBH is converted in DBH (Diameter at Breast Height) and applied to allometric equations for estimation of merchantable stem volume. For application of allometric equations, trees were divided in two classes of DBH:

- DBH ranging from 4.46 cm to 81.99 cm: application of allometric equation from NOGUEIRA et al. (2008)⁹. This equation was adjusted for estimating bole volume of trees with DBH ranging from 5 to 82 cm (excepting palm trees). This equation has been derived using DBH based on datasets that comprise more than 30 trees (i.e. 298 trees). The model was based on statistically significant regression and has an r^2 that is higher than 0.8 (i.e. $r^2 = 0.971$):

$$\ln(\text{Volume, m}^3) = 8.939 + 2.507 \cdot \ln(\text{DBH, cm})$$

⁹ NOGUEIRA, E.M.; FEARNSTIDE, P.M.; NELSON, B.W.; BARBOSA, R.I.; KEIZER, E.W.H., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. *Forest Ecology and Management*, 256(2008): 1853-1867.

- DBH higher than 82.00 cm: application of allometric equation from COLPINI et al. (2009)¹⁰. The COLPINI et al. (2009) Kopezky – Gehrhardt allometric equation was applied for estimating the merchantable volume of trees (excepting palm trees). This equation has been derived using DBH based on datasets that comprise more than 30 trees (i.e. 91 trees). This equation was based on statistically significant regression and has an r^2 that is higher than 0.8. According to COLPINI et al. (2009), the Kopezky – Gehrhardt model showed the best performance among single-entry models for estimation of volumes with bark in the same forest type observed in the FSM region. The Kopezky – Gehrhardt model, presented below, provided an r^2 of 0.928. Given that the allometric equation has been obtained for individuals having DBH higher than 82 cm (i.e. ranging from 15-cm to 135-cm DBH), the equation was applied for trees with DBH higher than this threshold inside the FSM farm.

$$\text{Volume, m}^3 = -0.4306 + 0.0011 * (\text{DBH, cm})^2$$

Both equations correspond to a local forest-type specific model, whose data were collected in the same type of forest (“As”, according to the official IBGE classification; Open Forest of South Amazon) at distances of about 120 km from the FSM farm.

COLPINI’s model was adjusted for a forest fragment located at the municipality of Cotriguaçu (north-west region of the State of Mato Grosso) between latitudes 9°47’ and 9°53’ S and longitudes 58°13’ and 58°19’ W, with altitude varying between 100 and 150 m.

For NOGUEIRA’s model, data collection was performed also in the municipality of Cotriguaçu and other two municipalities: Juruena and Carlinda, State of Mato Grosso. In NOGUEIRA et al. (2008), in South Amazon sampling sites, the vegetation was described as open forest, including the Carlinda site in the northwestern portion of the State of Mato Grosso. Except for the Carlinda site, where evidence of previous disturbance was observed, all other plots were in primary forest, without invasion of pioneer trees or mortality associated with edges.

Note that this forest type specific equation does not include palm species and so a specific equation for this growth form was used. The equation used for estimation of total aboveground biomass in palm species was that presented by SALDARRIAGA et al. (1988)¹¹:

$$\ln(\text{Mass, kg}) = -6.3789 - 0.877 * \ln(1/(\text{DBH, cm})^2) + 2.151 * \ln(\text{Height, m})$$

This is likely to be the most suitable equation available for estimation of palm aboveground biomass in the Amazon biome. This equation was also applied by NOGUEIRA et al. (2008) as the most suitable for the Amazon biome. The SALDARRIAGA’s equation has an r^2 of 0.89 (above the minimum threshold required by the methodology, 0.80).

The results of the baseline field inventory are in conformance with the methodology accuracy requirements, as all biomass average estimations inside each stratum have an error below 15%, as shown in Table 4. The overall error of the biomass field inventory is estimated in 3.71%.

¹⁰ COLPINI, C.; TRAVAGIN, D.P.; SOARES, T.S.; SILVA, V.S.M. e, 2009. Determinação do volume, do fator de forma e da porcentagem de casca de árvores individuais em uma Floresta Ombrófila Aberta na região noroeste de Mato Grosso. *Acta Amazonica*, 39(1): 97-104.

¹¹ SALDARRIAGA, J.G., WEST, D.C., THARP, M.L., UHL, C., 1988. Long-term chronosequence of forest succession in the upper Rio Negro of Colombia and Venezuela. *Journal of Ecology*, 76: 938–958.

Table 4. Summary of the number of permanent plots in each stratum (n), as well as the estimates of sampling errors (E%) and coefficients of variation (CV) for each stratum

FOB Submontana Cipós e Palmeiras				n	
Plot area	2500 m2	t2	2.792241	70	(estimated)
Total area	425730000 m2	CV2	584.24	70	(measured)
N	170292	E%2	23.43		
t(69)	1.671				
E%	4.84				
CV	24.17				
Aluvial				n	
Plot area	2500 m2	t2	2.927521	25	(estimated)
Total area	131316000 m2	CV2	595.95	25	(measured)
N	52526.4	E%2	68.39		
t(24)	1.711				
E%	8.27				
CV	24.41				
FOB Submontana Densa				n	
Plot area	2500 m2	t2	3.0276	18	(estimated)
Total area	67210000 m2	CV2	727.25	18	(measured)
N	26884	E%2	119.03		
t(17)	1.740				
E%	10.91				
CV	26.97				
Encosta				n	
Plot area	2500 m2	t2	3.101121	15	(estimated)
Total area	92883000 m2	CV2	711.53	15	(measured)
N	37153.2	E%2	142.32		
t(14)	1.761				
E%	11.93				
CV	26.67				
TOTAL INVENTORY				n	
Plot area	2500 m2	t2	2.7556	128	(estimated)
Total area	717000000 m2	CV2	640.58	128	(measured)
N	286800	E%2	13.76		
t(127)	1.660				
E%	3.71				
CV	25.31				

The merchantable aboveground biomass of trees measured in the field (“Merchantable (trees) (t/ha)”) and the total aboveground biomass of palms (“Palms (aboveground) (t/ha)”) are shown in Figure 10. For total aboveground tree biomass calculation (“Aboveground”; t/ha), merchantable biomass of trees was multiplied by a BCEF (Biomass conversion and expansion factor) for conversion of merchantable volume to total aboveground tree biomass equal to 1.66¹². The total aboveground biomass of palms (“Palms (aboveground) (t/ha)”) was directly provided by the allometric equation for palms (SALDARRIAGA et al. 1988). For estimating the belowground

¹² Brown, S., A. J. R. Gillespie, and A. E. Lugo, 1989. Biomass estimation methods for tropical forests with applications to forest inventory data. Forest Science, 35:881-902. (Table 4; pg. 890; minimum value deducted from lowest limit.: 1.743 - 0.083 = 1.66)

biomass per stratum (“Belowground”; t/ha), the aboveground component (“Aboveground (total) (t/ha)”) was multiplied by a root-shoot ratio of 0.37¹³.

For calculating the carbon pools (above and belowground) for each stratum, the total biomass of the total area of each stratum was multiplied by a CF (Carbon Fraction) in Dry Matter equal to 0.47¹⁴ (conversion from dry mass to tC) and by 44/12 (conversion from tC to tCO₂).

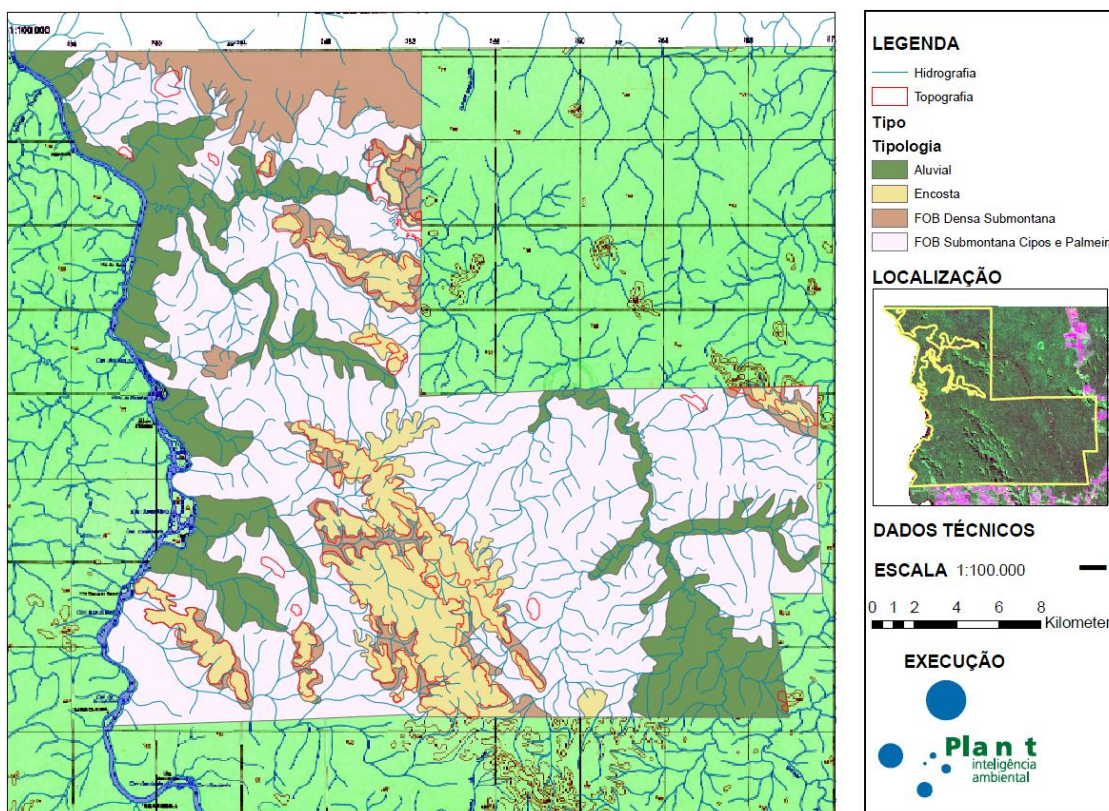


Figure 9. Thematic map of vegetation typologies (strata) and hydrography in FSM farm

¹³ 2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4.

¹⁴ Default value 0.47 tC t⁻¹ d.m. (3_CP-B, pg. 9).

Stratum	Area (ha)		Biomass					Total aboveground per stratum (t)	Total belowground per stratum (t)
			Merchantable (trees) (t/ha)	Palms (aboveground) (t/ha)	Aboveground (total) (t/ha)	Belowground (t/ha)			
Aluvial	11.974,69	18,9%	132,4	4,9	224,7	83,1	2.690.346,1	995.428,1	
Encosta	9.039,04	14,2%	158,0	6,0	268,3	99,3	2.424.950,4	897.231,6	
FOB Densa Submontana	2.670,87	4,2%	133,4	2,4	223,9	82,8	597.894,8	221.221,1	
FOB Submontana Cipós e Palmeiras	39.762,29	62,7%	140,0	6,3	238,7	88,3	9.491.678,7	3.511.921,1	
Total	63.446,89	100,0%					15.204.869,9	5.625.801,9	

Under Deforestation Risk Analysis		54.560,00
	CF	
	0,47	

Stratum	Carbon Pools	
	Aboveground, per stratum (tCO ₂)	Belowground, per stratum (tCO ₂)
Aluvial	4.636.363,1	1.715.454,3
Encosta	4.178.997,8	1.546.229,2
FOB Densa Submontana	1.030.372,0	381.237,6
FOB Submontana Cipós e Palmeiras	16.357.326,2	6.052.210,7
Total	26.203.059,1	9.695.131,9
	C_{AB_tree}	C_{BB_tree}

Figure 10. Characterization of above and belowground carbon stocks in Project Area (FSM estate), for different vegetation strata

Baseline emissions from unplanned deforestation

For estimating emissions from unplanned deforestation that would occur in Project Area in the absence of project (i.e. in the baseline case), the annual estimated area to be deforested (see “Estimation of annual areas of unplanned deforestation”; Table 3) multiplied the sum of aboveground and belowground carbon stocks in forest for each biomass stratum (see “Characterization of biomass in Project Area”; Figure 10). The result of this procedure is shown in Table 5.

Table 5. Summary of gross baseline emissions from unplanned deforestation that would occur within the Project Area in the baseline case

Gross baseline emissions from deforestation in FSM			Stratum	
Year	ha/year	ha (accumulative)	FOB Densa Submontana	tCO ₂
2009	42,56	42,56	tCO ₂ /year	22.494,41
2010	59,29	101,85		53.832,05
2011	59,29	161,15		85.169,68
2012	20,09	181,24		95.786,80

Gross baseline emissions from deforestation in FSM			Stratum Encosta	
Year	ha/year	ha (accumulative)	tCO ₂ /year	tCO ₂
2009	49,77	49,77	31.525,75	31.525,75
2010	69,34	119,11	43.919,47	75.445,22
2011	69,34	188,45	43.919,47	119.364,68
2012	23,49	211,95	14.879,82	134.244,50

Gross baseline emissions from deforestation in FSM			Stratum Aluvial	
Year	ha/year	ha (accumulative)	tCO ₂ /year	tCO ₂
2009	355,53	355,53	188.588,47	188.588,47
2010	495,31	850,84	262.728,22	451.316,69
2011	495,31	1.346,15	262.728,22	714.044,91
2012	167,81	1.513,95	89.011,75	803.056,66

Gross baseline emissions from deforestation in FSM			Stratum FOB Submontana Cipós e	
Year	ha/year	ha (accumulative)	tCO ₂ /year	tCO ₂
2009	855,48	855,48	482.137,11	482.137,11
2010	1.191,79	2.047,27	671.679,57	1.153.816,68
2011	1.191,79	3.239,06	671.679,57	1.825.496,25
2012	403,78	3.642,84	227.563,57	2.053.059,82

Gross baseline emissions from deforestation in FSM			Sum of Strata	
Year	ha/year	ha (accumulative)	tCO ₂ /year	tCO ₂
2009	1.303,35	1.303,35	724.745,75	724.745,75
2010	1.815,73	3.119,08	1.009.664,89	1.734.410,64
2011	1.815,73	4.934,81	1.009.664,89	2.744.075,53
2012	615,17	5.549,98	342.072,26	3.086.147,78

The areas exploited inside the FSM farm from 13rd April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. The documents showing the areas exploited within this

time period are available for consultation by auditors and will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

Emissions from biomass burning in the baseline

Based on the IPCC 2006 Inventory Guidelines, estimating greenhouse gas emissions from biomass burning was determined as:

$$E_{BiomassBurn,i,t} = \sum_{g=1}^G \left((A_{burn,i,t} * B_{i,t} * COMF_i * G_{g,i}) * 10^{-3} \right) * GWP_g$$

Where:

$E_{BiomassBurn,i,t}$	Greenhouse emissions due to biomass burning as part of deforestation activities in stratum i in year t; tCO ₂ -e of each GHG (CO ₂ , CH ₄ , N ₂ O)
$A_{Burn,i,t}$	Area burnt for stratum i at time t; ha
$B_{i,t}$	Average aboveground biomass stock before burning stratum i, time t; tonnes d.m. ha ⁻¹
$COMF_i$	Combustion factor for stratum i; dimensionless (default value derived from Table 2.6 of IPCC, 2006) ¹⁵
$G_{g,i}$	Emission factor for stratum i for gas g; kg t ⁻¹ dry matter burnt (default values derived from Table 2.5 of IPCC, 2006) ¹⁶
GWP_g	Global warming potential for gas g; t CO ₂ /t gas g (default values from IPCC SAR: CO ₂ = 1; CH ₄ = 21; N ₂ O = 310)
g	1, 2, 3 ... G greenhouse gases
i	1, 2, 3 ...M strata
t	1, 2, 3, ... t years elapsed since the start of the REDD project activity

Table 6 shows the parameters used in calculation of biomass burning for the baseline scenario, as well as results accounted for CH₄ and N₂O emissions generated as a consequence of incomplete biomass burning of non-commercial wood after logging.

¹⁵ E-BB; ANNEX 1; Table 2.6; page 6 “All tertiary tropical forest”: 0.59

¹⁶ E-BB; Table 2.5; page 8 “Tropical forest”: For CH₄: 6.8 - 2 = 4.8 g kg⁻¹ dry matter burnt (conservative); For N₂O: 0.20 g kg⁻¹ dry matter burnt (unique value proposed).

Table 6. Summary of parameters used in calculation and results for biomass burning emissions in the baseline scenario (CH₄ and N₂O)

COMF	0,59		
G_{CH4}	4,8	GWP_{CH4}	21
G_{N2O}	0,2	GWP_{N2O}	310

CH₄

N₂O

Biomass Burning Emissions			Sum of Strata		Sum of Strata	
Year	ha/year	ha (accumulative)	tCO ₂ /year	tCO ₂	tCO ₂ /year	tCO ₂
2009	1.303,35	1.303,35	17.289,20	17.289,20	10.634,23	10.634,23
2010	1.815,73	3.119,08	24.086,10	41.375,31	14.814,87	25.449,10
2011	1.815,73	4.934,81	24.086,10	65.461,41	14.814,87	40.263,96
2012	615,17	5.549,98	8.160,32	73.621,73	5.019,24	45.283,21

The areas exploited inside the FSM farm from 13rd April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. The documents showing the areas exploited within this time period are available for consultation by auditors and will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

Wood products carbon pool in the baseline

For estimating the biomass carbon of the commercial volume extracted in the process of deforestation, the following equation was applied, according to “Option 2: Commercial inventory estimation”, as recommended in CP-W:

$$C_{XB,i} = C_{AB_tree,i} * \frac{1}{BCEF} * Pcom_i$$

Where:

C_{XB,i} Mean stock of extracted biomass carbon from stratum i; t CO₂-e ha⁻¹

C_{AB_tree,i} Mean aboveground biomass carbon stock in stratum i; t CO₂-e ha⁻¹

BCEF BCEF for conversion of merchantable volume to total aboveground tree biomass; dimensionless

Pcom _i	Commercial volume as a percent of total aboveground volume in stratum i; dimensionless (calculated as the ratio between the volume of merchantable wood in exploitation, 35.08 m ³ /ha, and the total volume of aboveground biomass per stratum)
i	1, 2, 3, ... M strata

In order to calculate the proportion of biomass carbon extracted that remains sequestered in long-term wood products after 100 years, it was simply and conservatively assumed that all extracted biomass not retained in long-term wood products after 100 years is emitted in the year harvested, instead of tracking annual emissions through retirement, burning and decomposition. All factors are derived from Winjum et al. 1998¹⁷.

$$C_{WP,i} = \sum_{ty=s,w,oir,p,o} C_{XB,ty,i} * (1 - WW_{ty}) * (1 - SLF_{ty}) * (1 - OF_{ty})$$

Where:

C _{WP,i}	Carbon stock in long-term wood products pool (stock remaining in wood products after 100 years) from stratum i post deforestation; t CO ₂ -e ha ⁻¹
C _{XB,ty,i}	Mean stock of extracted biomass carbon by class of wood product ty from stratum i; t CO ₂ -e ha ⁻¹
WW _{ty}	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product ty; dimensionless (0.24 for developing countries; Winjum et al. 1998 cited by CP-W)
SLF _{ty}	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product ty; dimensionless (0.2 for sawnwood; Winjum et al. 1998 cited by CP-W)
OF _{ty}	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product ty; dimensionless (0.84 for sawnwood in tropical forests; Winjum et al. 1998 cited by CP-W)
ty	Wood product class – defined here as sawnwood (s)
i	1, 2, 3, ... M strata

¹⁷ Winjum, J.K., Brown, S. and Schlamadinger, B. 1998. Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide. Forest Science 44: 272-284

The parameters used in calculation of wood products carbon pool in the baseline, as well as the results of estimates (sum of strata), are demonstrated in Table 7.

Table 7. Summary of calculations of wood products carbon pool in the baseline scenario

Merchantable wood in exploitation (m ³ /ha)	35,08					WW _{ty} 0,24
Wood average density (t/m ³)	0,59					SLF _{ty} 0,20
Forest management cycle (years)	1					OF _{ty} 0,84

Stratum	C _{AB_tree} (tCO _{2e} /ha)	BCEF	Pcom	C _{XB} (tCO _{2e} /ha)	C _{WP} (tCO _{2e} /ha)
Aluvial	387,18	1,66	0,09217	21,50	2,09
Encosta	462,33	1,66	0,07719	21,50	2,09
FOB Densa Submontana	385,78	1,66	0,09250	21,50	2,09
FOB Submontana Cipós e Palmeiras	411,38	1,66	0,08675	21,50	2,09
				86,0	8,37

Wood average density (0.59 t/m³): Source: Brown, S., A. J. R. Gillespie, and A. E. Lugo, 1989. Biomass estimation methods for tropical forests with applications to forest inventory data. Forest Science, 35:881-902. (see pg. 890, Table 4, Moist)

Wood products carbon pool in baseline			Sum of Strata	
Year	ha/year	ha (accumulative)	tCO ₂ /year	tCO ₂
2009	1.303,35	1.303,35	2.725,63	2.725,63
2010	1.815,73	3.119,08	3.797,16	6.522,79
2011	1.815,73	4.934,81	3.797,16	10.319,95
2012	615,17	5.549,98	1.286,47	11.606,42

Pasture carbon pools in the baseline

For calculation of the carbon pool remaining on pasture after deforestation, a conservative value of 15.0 tCO₂/ha was applied (2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 6: Grassland, pg. 6.27, Table 6.4). The proportion of baseline deforestation converted to pasture was considered as 90%. Table 8 summarizes the results obtained for pasture carbon pools in the baseline scenario.

Table 8. Results obtained for calculations of pasture carbon pools in baseline scenario

Baseline Pasture Carbon Pool			Sum of Strata	
Year	ha/year	ha (accumulative)	tCO ₂ /year	tCO ₂
2009	1.303,35	1.303,35	17.586,97	17.586,97
2010	1.815,73	3.119,08	24.500,94	42.087,91
2011	1.815,73	4.934,81	24.500,94	66.588,84
2012	615,17	5.549,98	8.300,86	74.889,71

Coffee carbon pools in the baseline

For calculation of the carbon pool remaining on coffee crops after deforestation, a conservative value of 84.0 tCO₂/ha was applied¹⁸. The proportion of baseline deforestation converted to coffee cultivation was conservatively considered as 10%. The results obtained for coffee cultivation carbon pools in the baseline scenario are presented in Table 9.

Table 9. Results obtained for calculations of coffee cultivation carbon pool in baseline scenario

Baseline Cofee Carbon Pool			Sum of Strata	
Year	ha/year	ha (accumulative)	tCO ₂ /year	tCO ₂
2009	1.303,35	1.303,35	10.943,77	10.943,77
2010	1.815,73	3.119,08	15.246,09	26.189,86
2011	1.815,73	4.934,81	15.246,09	41.435,95
2012	615,17	5.549,98	5.165,34	46.601,30

4.2 Project Emissions

The project emissions are related to forest management activities carried out inside the Project Area. The net emissions in the project case are estimated by combining:

¹⁸ DOSSA et. al. Above- and belowground biomass, nutrient and carbon stocks contrasting an open-grown and a shaded coffee plantation. Agroforest Syst (2008) 72:103–115. DOI 10.1007/s10457-007-9075-4.

- Emissions arising from logging gap: encompass emissions from felling timber tree and emissions from incidental damage caused by falling timber tree,
- Emissions from infrastructure: from constructing logging infrastructure for removal of timber, such as haul roads, skid trails and logging decks.

The areas exploited inside the FSM farm from 13rd April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. Thus, the emissions occurring inside these areas were not quantified for the present verification period.

4.3 Leakage

Market Leakage - LK-ME

As explained in previous topics, the process of deforestation in the baseline scenario involves timber harvesting for commercial markets, prior to implementation of pasture or coffee crops. As described in item “1.10 Conditions Prior to Project Initiation” of this VCS-PD, coffee crops represent about 10% of land use in BAU, while pasture accounts for virtually all the remaining land occupation. The implementation of these BAU activities is usually financed by means of initial capital obtained in wood logging. Similarly to the Reference Area and Project Area, the Leakage Belt is also subject to serious risks of land-grabbing promoted by illegal organizations (i.e. family-scale land-grabber associations, land-property documentation forgers), mostly supported by unscrupulous sawmills and political interests. As seen in “STEP 2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios” of this VCS-PD, the maintenance of native forest is far of being the most attractive economic scenario, giving the opportunity for land use shifting from native forest to pasture and coffee crops. In this context, the local communities have a widespread culture of deforestation, mainly led by economic factors. Thus, market leakage estimate is mandatory for this project. Leakage due to market effects is equal to the baseline emissions from logging multiplied by a leakage factor:

$$LK_{MarketEffects,timber} = \sum_{i=1}^M (LF_{ME} * AL_{T,i})$$

Where:

$LK_{MarketEffects,timber}$	Total GHG emissions due to market- effects leakage through decreased timber harvest; t CO ₂ -e
LF_{ME}	Leakage factor for market-effects calculations; dimensionless

$AL_{T,i}$	Summed emissions from timber harvest in stratum i in the baseline case potentially displaced through implementation of carbon project; t CO ₂ -e
i	1,2,3,...M strata

The deduction factor (LF_{ME}) was adopted as 0.2, based on the fact that the forest biomass is considered to be less in Project Area than in the average of Amazon Biome. It is important to consider that the Market Leakage is not calculated only for the Reference Area, but for all Amazon Biome. The scientific literature demonstrates that the forest occurring inside the FSM region has less biomass than that observed in the average of Amazon Biome. Thus, it is expected that the areas to be deforested in the Amazon Biome in the project case, as a result of project leakage, are less than those that would be observed in the project region.

The total volume that would have been logged in the baseline in the project area, across strata and time periods, is estimated as follows:

$$AL_{T,i} = \sum_{t=1}^t (C_{B_{SL,XBT,i,t}})$$

Where:

$AL_{T,i}$	Summed emissions from timber harvest in stratum i in the baseline case potentially displaced through implementation of carbon project; t CO ₂ -e
$C_{B_{SL,XBT,i,t}}$	Carbon emission due to displaced timber harvests in the baseline scenario in stratum i in time t ; t CO ₂ -e
i	1, 2, 3, ...M strata
t	1, 2, 3, ... t years elapsed since the projected start of the REDD project activity

The carbon emission due to the displaced logging has two components: the biomass carbon of the extracted timber and the biomass carbon in the forest damaged in the process of timber extraction:

$$C_{B_{SL,XBT,i,t}} = ([V_{B_{SL,XE,i,t}} * D_{mn} * CF] + [V_{B_{SL,XE,i,t}} * LDF] + [V_{B_{SL,XE,i,t}} * LIF]) * \frac{44}{12}$$

Where:

$C_{B_{SL,XBT,i,t}}$	Carbon emission due to timber harvests in the baseline scenario in stratum i at time t ; t CO ₂ -e
----------------------	---

$V_{BSL,EX,i,t}$	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum i at time t; m^3
D_{mn}	Mean wood density of commercially harvested species; $t\ d.m.m^{-3}$
CF	Carbon fraction of biomass for commercially harvested species j; $t\ C\ d.m.^{-1}$
LDF	Logging damage factor; $t\ C\ m^{-3}$ (default $0.53\ t\ C\ m^{-3}$ for broadleaf and mixed forests)
LIF	Logging infrastructure factor; $t\ C\ m^{-3}$ (default $0.29\ t\ C\ m^{-3}$)
i	1, 2, 3, ... M strata
t	1, 2, 3, ... t years elapsed since the projected start of the REDD project activity

Table 10 summarizes the calculation steps and results of market leakage estimates for the FSM-REDD Project.

Table 10. Market Leakage: calculation steps and annual estimates

D_{mn}	0,59 t/m^3
CF	0,47
LDF	0,53 tC/m^3
LIF	0,29 tC/m^3

Year							$C_{BSL,XBT,i,t}$
2009	(	6	+	12,2324	+	6,6932) * 3,666667	= 92,9 tCO_2/ha
2010	(	6	+	11,87988	+	6,500312) * 3,666667	= 90,2 tCO_2/ha
2011	(	6	+	11,1724	+	6,1132) * 3,666667	= 84,8 tCO_2/ha
2012	(	5	+	10,3774	+	5,6782) * 3,666667	= 78,8 tCO_2/ha

Year	V_{BSL}	Market Leakage			Sum of Strata
		ha/year	ha (accumulative)	$C_{BSL,XBT}$	$AL_T * LF_{ME}$
2009	23,1 m^3/ha	1.303,35	1.303,35	121.044,76	24.209,0
2010	22,4 m^3/ha	1.815,73	3.119,08	163.771,35	32.754,3
2011	21,1 m^3/ha	1.815,73	4.934,81	154.018,31	30.803,7
2012	19,6 m^3/ha	615,17	5.549,98	48.467,99	9.693,6

Leakage outside the Leakage Belt (Step 4 - LK-ASU)

Immigrants prevented from migrating into and deforesting the project area are conservatively assumed to migrate to an alternative forest area and to cause deforestation in the alternative area. The alternative forest area could be within the Leakage Belt or it could be elsewhere in the country. The proportion migrating to the Leakage Belt is calculated as the area of the Leakage Belt as a proportion of the total available forest area nationally (AVFOR). AVFOR was estimated as follows:

$$AVFOR = TOTFOR - PROTFOR - MANFOR$$

Where:

AVFOR	Total available national forest area for unplanned deforestation; ha
TOTFOR	Total available national forest area; ha
PROTFOR	Total area of fully protected forests nationally; ha
MANFOR	Total area of forests under active management nationally; ha

As the country has a great variety of forest biomes in all its extension, TOTFOR considered only the Amazon Rainforest biome. This is a conservative approach. Thus, as a representation of the total area of Amazon Rainforest in Brazilian Territory, TOTFOR consisted of multiplying the country territory by 49.29%¹⁹ (proportion of Amazon comprised in Brazilian Territory). As a result, TOTFOR represents 418,965,000 ha.

As TOTFOR as considered only for the Amazon biome, PROTFOR and MANFOR were evaluated solely for Brazilian Northern and Centre-West macro-regions. According to the CNUC²⁰; National Registry of Conservation Units, PROTFOR is estimated in 158,413,767 ha.

According to the SNUC (National System of Conservation Units) (regulated by Federal Decree No. 4340, August 22, 2002), there are two groups of Conservation Units, instituted by Federal Law No.9985/2000: 1) Integral Protection Units and 2) Sustainable Use Units (SEMA, 2011²¹). The value of PROTFOR already comprises both types of Conservation Units. Thus, PROTFOR (above) already includes data on Forest Management Lands (UCs) (MANFOR).

In this context, AVFOR is estimated in 260,551,233 ha.

¹⁹ http://www.cliquesemiario.org.br/not_0110.htm

²⁰ Cadastro Nacional de Unidades de Conservação - <http://www.mma.gov.br/sitio/index.php?ido=conteudo.monta&idEstrutura=119&idConteudo=10747&idMenu=11810> (Norte e Centro-Oeste; nome da UC; Descrição dos documentos)

²¹ <http://www.sema.rs.gov.br/>

The proportion of Leakage Belt area related to the total available national forest area ($PROP_{LB}$) is calculated by dividing Leakage Belt area (LBFOR; 65,570 ha) by AVFOR. This procedure results in $PROP_{LB}$ equal to $2.5166 \cdot 10^{-4}$ (dimensionless).

The average carbon stock across the Leakage Belt (C_{LB} ; 238.6 tCO₂/ha; based on similarity analysis, data from the Project Area was applied to Leakage Belt area) and the average carbon stock for all available forest area outside the Leakage Belt (C_{OLB} ; 578.1 tCO₂/ha²²) were taken for calculation of the proportional difference in carbon stocks between areas of forest available for unplanned deforestation both inside and outside the Leakage Belt ($PROP_{CS}$). $PROP_{CS}$ is calculated by dividing the stock outside the Leakage Belt (C_{OLB}) by the stock inside the Leakage Belt (C_{LB}), which results in a value of 2.4231.

The proportion of baseline deforestation caused by immigrating population ($PROP_{IMM}$) was estimated for a period from 2005 to 2010. For calculating $PROP_{IMM}$, the participatory rural appraisal (PRA) approach was replaced by local data available from IBGE. This practice is justified by the fact that the IBGE has a precise approach for accounting population locally, which allows calculating the number of immigrants for a given period of time in the municipality of Colniza. The number of immigrants can be estimated by subtracting the number of annual births from the total annual population growth in the municipality of Colniza (IBGE, 2011²³). It is then assumed that the total annual population growth in a given municipality is attributed to: i) births and ii) immigration. Thus, by subtracting the number of annual births from the total annual population growth, it is possible to infer the number of immigrants. This technique also assumes that the IBGE assessment is applicable to estimate population movements in both urban and rural zones (i.e. it is assumed that the residential proportion of immigrants in the urban zone was estimated with accuracy similar to that observed in the rural zone estimates). According to the number of immigrants, we have inferred the proportion of deforestation attributed to immigrant agents ($PROP_{IMM}$) as 6.59%.

The proportional leakage for areas with immigrating populations (LK_{PROP}) was then equal to the immigrating proportion multiplied by the proportion of available national forest area outside the Leakage Belt multiplied by the proportional difference in stocks between forests inside and outside the Leakage Belt.

$$LK_{PROP} = PROP_{IMM} * (1 - PROP_{LB}) * PROP_{CS}$$

Where:

- LK_{PROP} Proportional leakage for areas with immigrating populations; proportion
- $PROP_{IMM}$ Estimated proportion of baseline deforestation caused by immigrating population; proportion

²² S.S. Saatchi, R.A. Houghton, R.C. dos Santos Alvalá, J.V. Soares, and Yifan Yu. Distribution of Aboveground Live Biomass in the Amazon Basin. 2007. (157.66.tC/ha)

²³ <http://www.ibge.gov.br/cidadesat/topwindow.htm?1>

PROP_{LB} Area of forest available for unplanned deforestation as a proportion of the total national forest area available for unplanned deforestation; proportion

PROP_{CS} Proportional difference in stocks between areas of forest available for unplanned deforestation both inside and outside the Leakage Belt; proportion

LK_{PROP} was estimated in 0.159.

Table 11 summarizes the results obtained for *ex post* calculation of Leakage outside the Leakage Belt.

Table 11. Estimation results for *ex post* leakage outside the Leakage Belt

Leakage Outside	Sum of Strata
	$\Delta C_{LK-ASU,OLB}$
Year	tCO ₂ /year
2009	67,14
2010	93,54
2011	93,54
2012	31,78

4.4 Summary of GHG Emission Reductions and Removals

Net GHG Emission Reductions and Removals can be summarized as the “**Estimated baseline emissions**” minus the “**Estimated project emissions**” minus the “**Estimated leakage emissions**”, whose components are presented below.

Estimated baseline emissions:

Baseline emissions from unplanned deforestation

(+)

Emissions from biomass burning in the baseline

(-)

Sum of Wood Products, Pasture, and Coffee Carbon Pools in the baseline case

Estimated project emissions:

Emissions arising from logging gap in Project Area

(+)

Emissions from constructing logging infrastructure for removal of timber in Project Area

(-)

Wood Products Carbon Pool in Project Area

Estimated leakage emissions

(Sum of Market Leakage and Leakage outside the Leakage Belt)

The areas exploited inside the FSM farm from 13rd April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. The documents showing the areas exploited within this time period are available for consultation by auditors and will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

Years	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)
2009	721.412,8	0.0	24.276,1	697.136,7
2010	1.005.021,7	0.0	32.847,8	972.173,9
2011	1.005.021,7	0.0	30.897,2	974.124,5
2012	340.499,1	0.0	9.725,4	330.773,8
Total	3.071.955,3	0.0	97.746,5	2.974.208,8

Year	REDD Benefits (buffer included) (tCO ₂)	REDD Benefits (buffer excluded) (tCO ₂)	Buffer discount (13.5%)	Annual Net REDD benefits (tCO ₂)	Accumulative Net REDD benefits (tCO ₂)
2009	697.136,7	603.023,3	94.113,5	603.023,3	603.023,3
2010	972.173,9	840.930,4	131.243,5	840.930,4	1.443.953,6
2011	974.124,5	842.617,7	131.506,8	842.617,7	2.286.571,3
2012	330.773,8	286.119,3	44.654,5	286.119,3	2.572.690,6
	2.974.208,8	2.572.690,6	401.518,2	2.572.690,6	

5 ADDITIONAL INFORMATION

The areas exploited inside the FSM farm from 13rd April 2009 to 31st December 2011 were excluded from the calculation of VCU benefits. This is due to the fact that these areas were not previously certified by the FSC (Forest Stewardship Council) and, consequently, were not eligible to the Project, according to M-MON v2.0. Thus, the baseline emissions and project emissions occurring inside these areas were not quantified for the present verification period.

The project proponent has stated and demonstrated through satellite imagery that no natural disturbances have occurred in the project area within this verification timeframe.