ROUNDTABLE ON SUSTAINABLE PALM OIL

NEW PLANTING PROCEDURES

SUMMARY REPORT

SOCIO ENVIRONMENTAL IMPACT ASSESSMENT AND HIGH CONSERVATION VALUES

ADM - BRAZIL

STATE OF PARÁ - BRAZIL

Version 3

December, 2014

SUMMARY

REPORT ON SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT AND HIGH CONSERVATION VALUE – SEIA/HCV

1. EXECUTIVE SUMMARY

This report presents the executive summary of the final results of the **Social and Environmental Impact Assessment and High Conservation values of the Palm Oil** Production project in the Northest of Pará – Brazil, carried out by the company *Orbis-Exceller Soluções Ambientais* for the Archer Daniels Midland Company (ADM - Brazil).

In 2012, ADM began to implement their plans for the production of palm oil. These plans are to plant 7,600 ha of palm oil, with 5,600 ha in business partnerships and 2,000 ha of production in partnership with smallholders (family producers).

In the business partnerships, ADM signs a contract with the landowner. ADM is responsible for land preparation, planting and all agricultural activities. The amount paid to each landowner depends on the details of the contract agreed by both parties in each individual case.

In the case of smallholder production (family producers), partnerships take the form of a contract whereby smallholders produce palm oil and provide an exclusive supply of Fresh Fruit Bunches, with support from ADM and financial backing from *PRONAF Eco Palm*. The contracts are signed between the Company, the Smallholder and Rural Unions, with the support and validation of Producers Associations. PRONAF Eco Palm is a line of credit specific to palm oil and family producers, designed by the Brazilian Federal Government.

The smallholder undertakes to carry out the planting, maintenance and harvesting of palm oil, according to the technical recommendations provided by the company. The smallholder also undertakes to sell all the production to the company. In turn, the company provides the technical assistance necessary for the proper management of the plantation and guarantees the purchase of the entire production. The company also provides inputs, tools and PPE, which are included in the budget. In other words, they are provided by the company, but are paid by the producer, since they are included in the cost of financing the project. The output price is set by a mechanism established in the contract, according to which the value of a ton of Fresh Fruit Bunches (FFB) is calculated as a percentage of the value of a ton of crude palm oil on the international market (CIF Rotterdam).

The project is located in the northeast of Pará/Brazil. The region is one of the oldest areas of occupation of the Brazilian Amazon and has an essentially agricultural character, composed of large, medium and small farms.

The study consisted of four steps. Step 1 involved the assessment of High Conservation Value (HCV), confirmation of the existence of free, prior and informed consent and the provision of advice on the preparation of the plantation area. This step was carried out in 2013 for ADM's new planting in that year. Step 2 involved an assessment of the social and environmental impacts of the project, at the local and landscape scales, also including the evaluation of High Conservation Value (HCV) at the landscape scale. Step 3 included analyses of the areas of new plantings to be undertaken in 2014, referring to the assessment of the High Conservation Value (HCV) and confirmation of the existence of free, prior and informed consent, and the provision of advice on the preparation of plantation areas. Step 4 involved mapping of smallholdings areas, new consultation to assessment of HCV and calculation of HCV areas on smallholdings (family farms).

The Social and Environmental Impacts Assessment, including HCV assessment, analysed the primary and secondary information obtained in the region of the project. The full version is divided as follows: part I - Introduction, Characterization, and Description of the Enterprise and the Social and Environmental impacts of palm oil production; part II - The Physical Environment, with analyses of geomorphology, soil and water resources; part III – The Biotic Environment, with assesssments of vegetation and fauna (birds and mammals); part IV - Land Cover and deforestation, with analyses of the deforestation of areas for planting after November 2005; V - Socioeconomics, with analyses of the socioeconomic data about the region and consultations with public and private stakeholders and smallholders (family producers); VI - Integrated Analysis, with assessments of criteria 5, 6 and 7 of RSPO, (integrated assessment of Social and Environmental Impacts, Mitigation Measures and Socio and Environmental Programs.)

At this stage, the baseline of the project has been established, by measuring the initial conditions that can be monitored over the project activities. The social and environmental impacts are both direct (observable at present development of the activity) and indirect (presumable from the characteristics of the activities).

The social and environmental impacts are positive and negative. The mitigation and compensation measures seek to decrease, mitigate or compensate for the adverse environmental and social impacts, while other programs and measures aim to maximize the positive impacts.

The social and environmental fragility of the region, due to low levels of human development and infrastructure, the greatest environmental degradation of this region by agro-livestock activity, and the ecological importance of Endemism Center of Belém, means that any economic activity has a heightened social environmental responsibility.

1.1 Primary Forests

Originally, the region was covered by upland dense ombrophilous forest and alluvial dense ombrophilous forest (forests of floodplain and flooded areas). However, over the last 150 years, through the process of occupation, the original vegetation has been converted into agricultural areas - mainly cattle grazing and secondary forests in various stages of secondary succession and shrubland. Few fragments of forest remain, principally along the rivers and streams (forests of floodplain and flooded areas), and almost no area of primary forest.

The intended areas for planting in the business partnerships properties and smallholders are covered by cattle grazing and shrubland, in a mosaic of vegetation in different successional stages, where typical individuals of mature forest are rarely found. This vegetation can vary from scattered mono-dominant individuals about a meter high, up to mono-dominant aggregates of about five to six meters in high density. Generally these remnants have no vertical stratification, and their regenerative processes are hampered due to the dominance of grasses - usually *Imperata brasiliensis* (Brazilian satintail), and also the high density of lianas (*Dillenia* sp.) and scandent grasses (*Cyperus* sp.). In the properties of business partnership, the most common land cover is cattle grazing, although some vegetation fragments forming a mosaic of vegetation height and structure occurred in all properties, according to the different land uses in the properties. Areas with high frequency of use generally have lower vegetation. Thus within the same property there are patches of higher or lower shrubland due to the spatial and temporal dynamics of land use.

At the landscape scale, there are fragments of secondary vegetation, linked with forest set aside (legal reserve areas) of the properties and riparian forest. These areas, although they have been sorely impacted by logging, have high importance for conservation.

1.2 Peat or Fragile Soils

In the areas intended for planting, no peat or fragile soils were identified. This assessment was carried out from maps of soils of the region (SEMA-PA), fieldwork and satellite images.

At the landscape scale, there are soils associated with wetlands of the major rivers (River Capim, River Guamá and River Irituia). These areas are outside those intended for planting. These wetlands were also classified as HCV 1, and no planting was planned for this type of environment. In areas already planted at the period of assessment, it was found that no organic soil areas were used for planting.

In the region sandy soils occur, associated with ancient riverbeds, known locally as grasslands or white sand plains. These soils provide conditions for a unique natural environment and were classified as HCV 3. Due to the very low fertility of these areas, planting should not be done at these locations. These types of soil were not found in the areas to be planted.

1.3 Lands of Local Communities

The region of the project is essentially used for agro-livestock, consisting of medium and large properties and smallholders.

The business model established by ADM, in which there is no land purchase, but partnerships through contracts with landowners and smallholders gives to the project the characteristic of low land conflicts. In the case of business partnerships, agreements are established only with properties that have documents that guarantee the legality of land ownership within the national Brazilian criteria (property deeds or proof of purchase and sale). In the case of partnerships with smallholders, the contracts also require confirmation of land ownership. In this case, the existence of property deeds, proof of purchase and sale, and the suitability statement of PRONAF (DAP) are verified. When there are no property deeds, the statement of peaceful ownership (DPMP) is obtained. The DPMP contains a statement from the smallholder that lives and works on his/her property, and the consent of three neighbours of the property stating that there are no conflicts of legal, customary or user rights. All three parties sign this document.

In addition, funders (banks) of productions of smallholders also inspect land ownership. Dossiers are sent to these institutions, ensuring greater certainty of land ownership.

Regionally, there are local communities known as Maroons, which essentially consist of smallholders, frequently as family farmers. Such communities were identified and mapped in this assessment.

There are two indigenous lands in the region (Maracaxi and Upper River Guama), located approximately 20 km from the areas for planting oil palm. Such areas will not be directly influenced by the activities. Nevertheless, the production on two properties (Ariramba and Alegria) could have an indirect impact on Indigenous Land of the Upper River Guama, by interfering with the water quality of rivers that cross these properties and form the River Guama. The River Guama is located on the border of the indigenous land Upper River Guama.

1.4 High Conservation Values – HCV

High Conservation Values in different categories have been identified. Protected areas (Indigenous Lands) were classified as potential HCV 1. Potential HCV 1 was also assigned to the main fragments of forest in the region, where a total of 38 threatened or endangered species occurring or with potential to occur were recorded. The wetlands along the main rivers and nesting places of birds were also classified as HCV 1. Grasslands or white sand plains environments

(*campinaranas*) were categorized as HCV 3. HCV 4 was assigned to all riparian forests (Permanent Preservation Areas - PPA). The main rivers, which are important in the Amazon region for local people in terms of fishing, transportation, facilities, consumption and leisure, were classified as HCV 5. Potential HCV 6 was assigned to indications of occurrences of archaeological traces. Although archaeological sites have not been specifically identified, they have the potential to occur in the region.

The areas identified as HCVs are mainly located in the landscape scale. In the of business partnerships and smallholdings areas of planting, the areas to highlight are the fragments of forest that form the forest set aside (Legal Reserves) (classified as potential HCV 1) and the riparian forest (HCV 4). These areas are also protected by Brazilian law (Forest Code) and were not converted to plantation. The total of 2769.45 ha were identified as HCVs in the properties of business partnerships, corresponding to 1868.46 ha of HCV 1 and 900.98 ha of HCV 4. In smallholdings were mapped 2772.52 ha identified as HCVs, corresponding to 2032.48 ha of HCV 1 and 740.04 ha of HCV 4. Measures to maintain or increase these HCVs have been proposed and presented in a specific report, the main plans and procedures are the environmental regulation of the properties according to the Brazilian Forest Code of Legal Reserve (forest set asside) and Permanent Preservation Areas (riparian areas), with the potential to significantly increase of the High Conservation Value areas in the properties.

No HCVs replacements have been identified in the areas intended for palm oil plantation. In properties of business partnerships, the field surveys and historical analyzes of satellite images from 2006-2013 indicate replacement of secondary vegetation in small areas. The majority areas for planting occurred with replacement of cattle grazing. In smallholdings, the areas for planting were scrubland, already used for ancient agricultural areas, according to consultations with communities, field surveys and analysis of implementation process conducted by ADM.

2. SCOPE OF THE SOCIAL AND ENVIRONMENTAL IMPACTS ASSESSMENT - SEIA AND AREAS OF HIGH CONSERVATION VALUE - HCV

2.1. Identification of Organization

Name of the Company	ADM do Brasil
Address	Rod. Pará, 127, Bairro Novo. São Domingos do Capim. PA. ZIP CODE – 68635-000
National Register of Legal Entities - NRLE	02.003.402/0092-02
Person of Contact	Rodrigo Curvo
Phone	91-34371610 e 11-51853500
Email	Rodrigo.Curvo@adm.com
Legal Representative	Diego Di Martino
Status of Capital	LTDA
Status of land ownership	Business Partnerships and Smallholders Partnerships
Total planted area	7448,29 hectares
Planted area in business partnerships	5418,39 hectares
Planted area in partnership with smallholders	2029,90 hectares
Study scope	New development

2.2. Reference Documents

2.2.1 List of Reports

I. Social and Environmental Impacts Study of the Palm Oil Production Project of ADM Brazil. Northeast of Pará - Brazil. June 2013. Orbis Exceller Soluções Ambientais.
II. Study of the Potential of Deployment of the Palm Oil Production Project of ADM of Brazil. Pará - Brazil. 2011. Vigna Brasil Projetos.
III. Reports of the Progress of the Oil Palm Project of ADM of Brazil. Pará - Brazil. 2012. Eco Dendê.

2.2.2 List of Legal Documents

- Brazil, 1973. Established regulatory measures for rural labor. Federal Law No. 5.889, June 8, 1973.
- Brazil, 2006. Establishes guidelines for the formulation of the National Policy for Family Agriculture and Rural Family Production. Law Nº. 11.326, July 24, 2006.
- Brazil, 2011. Ministry of Labor. NR- 31: Safety and health in agricultural labor, livestock farming, forestry, silviculture and aquaculture. Ordinance Nº. 86, March 3, 2005. Revised with Ordinance MTE Nº. 2.546, December 14, 2011.
- Brazil, Forestry Code 12.651, most recent update: Law No. 12.727, October 17, 2012.
- Brazil, 2011. Instituted the Program to Support Environmental Conservation and the Program to Promote Rural Production. Law Nº. 12.512, October 14, 2011.
- Brazil, National Council on the Environment (Conselho Nacional de Meio Ambiente - CONAMA) Resolution Nº. 357, March 17, 2005.
- Brazil, National Council on the Environment (CONAMA). Resolution Nº. 398, April 3, 2008.
- Brazil. National Council on the Health. Ordinance Nº. 518, March 25, 2004.
- State Government of Pará. 2007. Ecological-Economic Macro-zoning in the state of Pará. Secretary of Science, Technolgy and Environmental Executive.
- Brazilian Agricultural Research Corporation (Embrapa). 2010. Agro-ecological zoning for palm oil in deforested areas of the legal Amazon- *ZAE-Dendê*.
- State Government of Pará. 2005. State Law No. 6745, May 6, 2005.
- Ministry of Agrarian Development (MDA). 2010. Program for Sustainable Palm Oil Production in Brazil.
- Ministry of the Environment (MMA). 2008. List of Endangered Brazilian Fauna. Normative Instruction No. 03/2003, Federal Official Gazette Nº. 101, Section 1, pgs. 88-97, May 28, 2003.
- Secretary of State and the Environment (SEMA). 2007. List of Threatened Flora and Fauna Species of the state of Pará. Available at: http://www.sema.pa.gov.br.

2.2.3 *List of Property Documents*

Business Partnership Properties

- Definitive proof of ownership.
- Proof of purchase and sale.
- Rural Environmental Registry (Cadastro Ambiental Rural – CAR) and Planting Authorization from SEMA/PA
- Proof of Payment of Rural Land Tax.
- Rural Environmental License (Licença Ambiental Rural - LAR).

Smallholders Properties

- Definitive proof of ownership.
- Proof of purchase and sale.
- Statement of PRONAF acquirement (DAP).
- Statement of Peaceful Ownership (DPMP).
- Rural Environmental Registry (Cadastro Ambiental Rural – CAR)
- Surveillance report on *PRONAF Eco Dendê*.
- Environmental Commitment Term (ECT).
- Rural Environmental License (Licença Ambiental Rural - LAR).

2.2.4 *List of Partnerships Documents Contracts*

Business Partnership Properties

- Partnership contract between ADM and landowner.
- Environmental Commitment Term (ECT).

Smallholders Properties

- Contract to support the Implementation of palm oil and exclusive supply of Fresh Fruit Bunches originating from smallholders.
- Bank Credit.

3. LOCATION AND REGION DESCRIPTION

The project of palm oil production in the North East of Pará by ADM covers areas in the municipalities of São Miguel do Guama, São Domingos do Capim, Irituia, Mão do Rio, Aurora do Pará, Concórdia do Pará, Santa Maria do Pará and Capitão Poço (figure 3.1).

The administrative office of ADM and the major activities related to smallholder partnerships are currently located in the city of São Domingos do Capim. The cities of São Miguel do Guamá and Mão do Rio are the headquarters of the Business Partnership.

By the end of 2012, the planted areas consisted of 3 properties of busines partnerships and 146 properties of smallholders. 5 business partnerships and 320 smallholders were involved in the 2013 planting cycle. In 2014, the ADM planted in 4 other business partnership properties.

The smallholdings range from 5 to 10 hectares. They are located in several rural communities in the municipalities of São Domingos do Capim, Irituia, Mãe do Rio and Capitão Poço.

Figure 3.1 below shows the location map of the area of operation of the project.

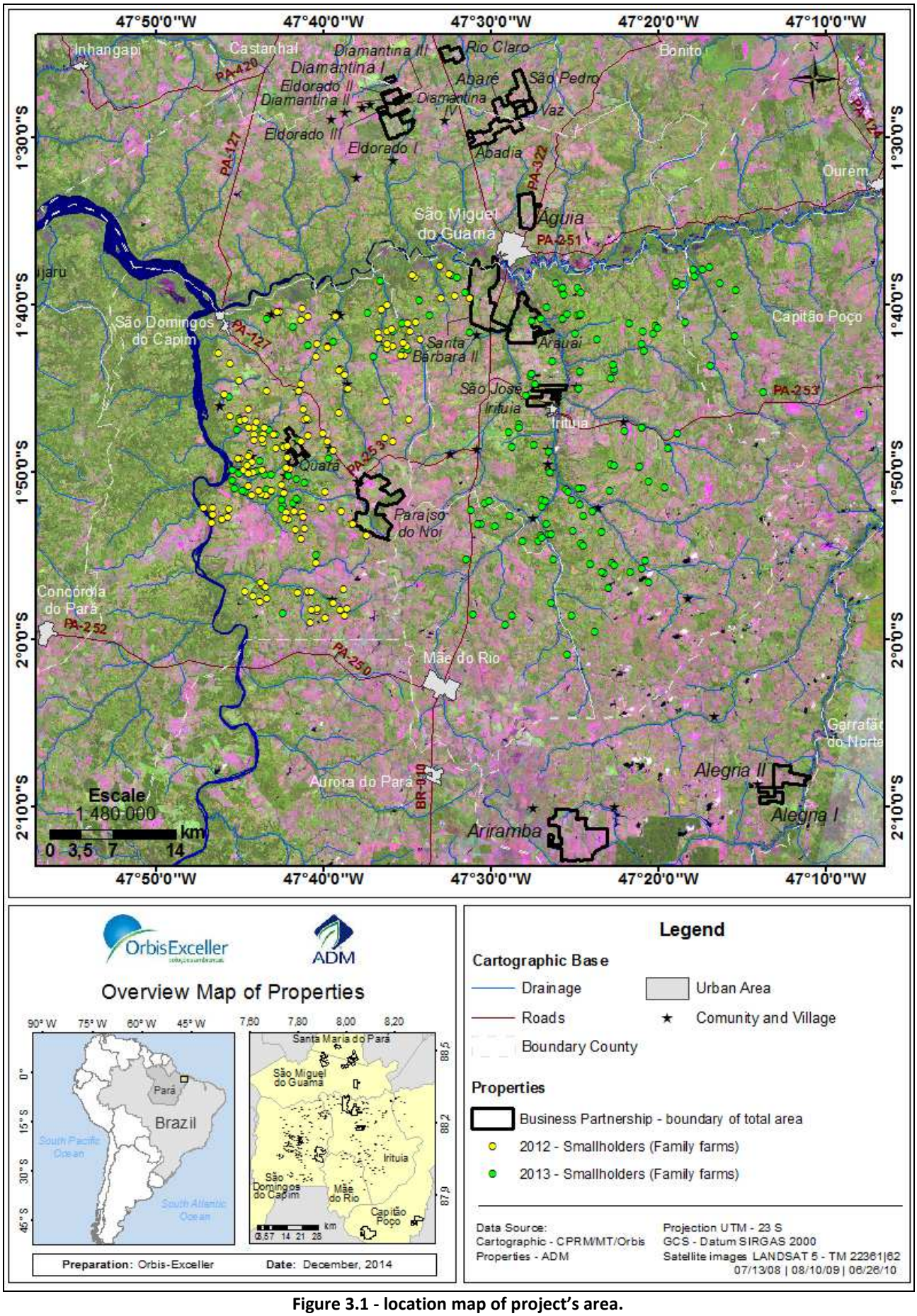


Figure 3.1 - location map of project's area.

The city of São Domingos do Capim is located about 170 km by road from Belém. The access to this city is by land and waterways.

The access is via highway BR 316 to the town of Castanhal, followed by the PA 127 highway to São Domingos do Capim. Access to the cities of São Miguel do Guamá and Mão do Rio is by highways BR 316 and BR 010.

In the agribusiness project area, the access to properties and smallholders is via secondary roads.

Figure 3.2 below shows the map of access roads in the project area.

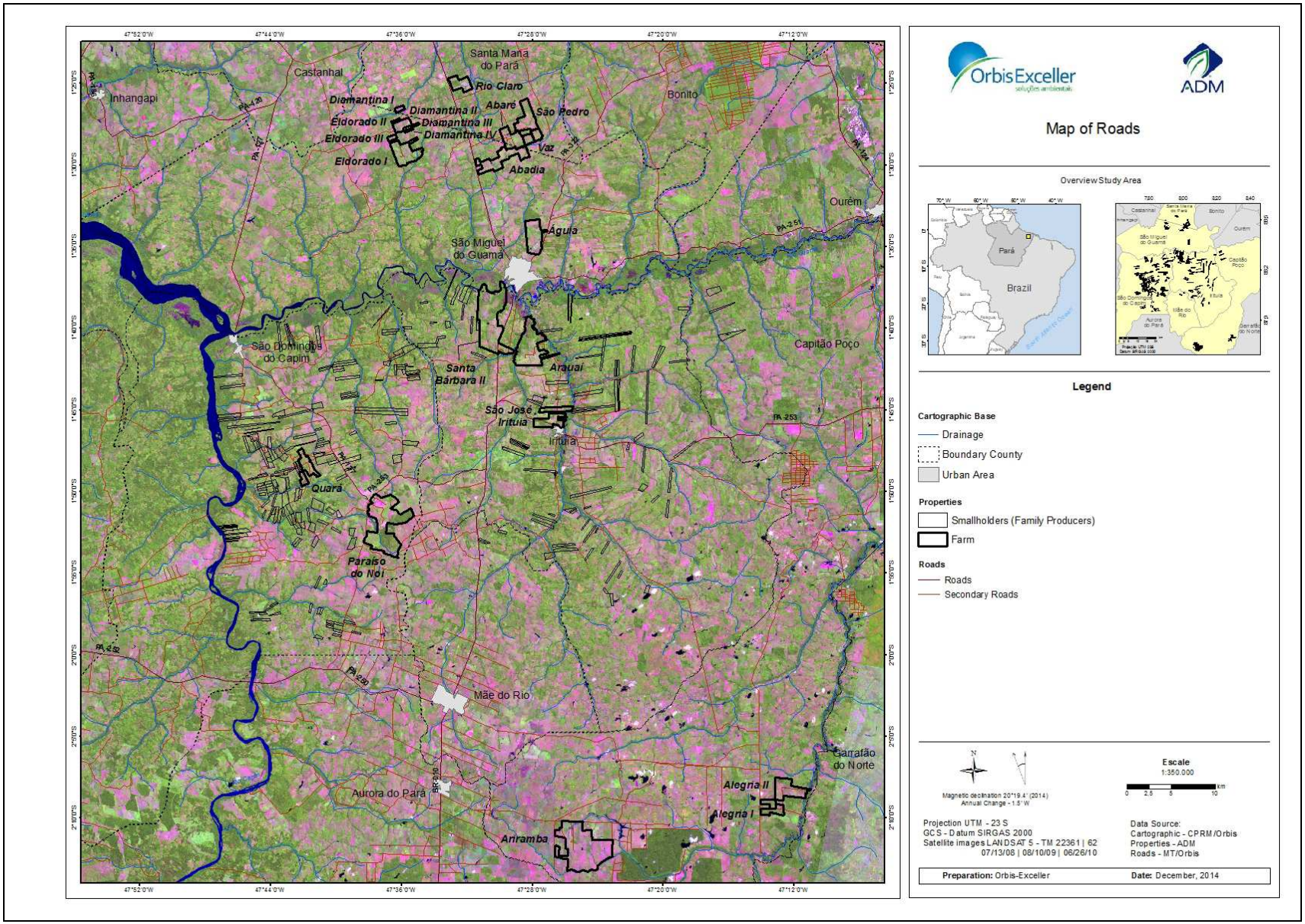


Figura 3.2 – map of access roads.

3.1. Land Use and Zoning

In the municipalities in the project's area of influence, the land cover is mostly of secondary vegetation, cattle grazing and agro-livestock. Some larger patches of vegetation are associated with the large rivers or on specific properties.

The main urban centers in the project's area of influence are the urban area of São Miguel do Guamá, Mão do Rio, Irituia, Aurora do Pará and São Domingos do Capim.

Since 2011, the region has undergone a modification in the land use, with degraded cattle grazing being replaced by palm oil crops. In the project area, besides the current production and expansion of planted areas of ADM, there are also areas of palm oil production of the company Merges in the North, and Belem Bioenergia in the south.

Currently, the the three main land uses of the region are: areas with cattle grazing and agro-livestock activities (including palm oil), abandoned areas of secondary vegetation (scrubland), and some remnants of alluvial dense ombrophilous forest, associated with the flooded margins of the Rivers Capim and Guamá and upland dense ombrophilous forest

Figure 3.3 below shows the map of land use in the project area.

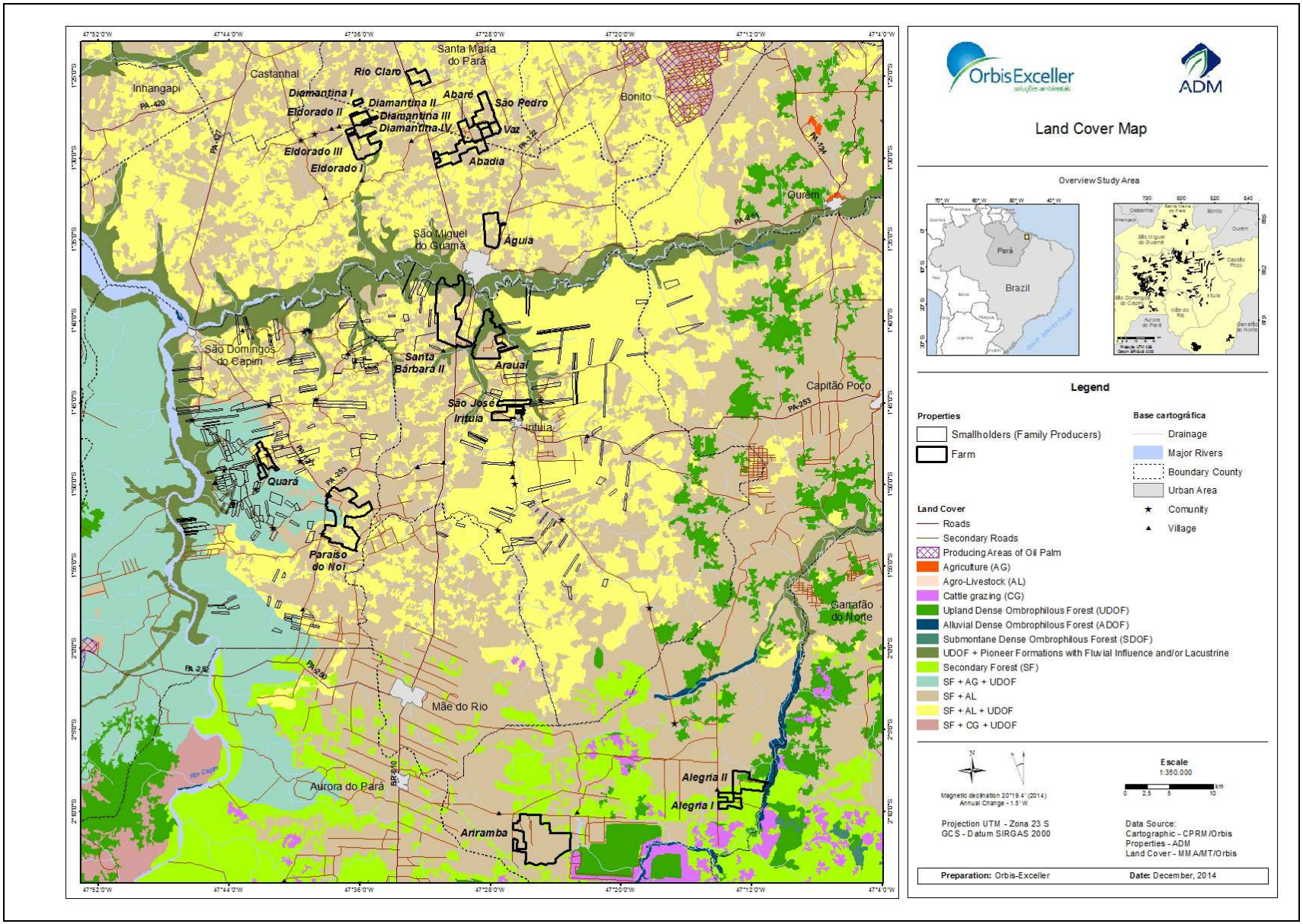


Figura 3.3 – Map of land use in the project area.

Agro-environmental Zoning for Palm Oil in the Legal Amazon

The agro-ecological zoning for palm oil in deforested areas of the Legal Amazon (ZAE-Palm Oil, by the Portuguese acronym), was developed by EMBRAPA (Embrapa, 2010).

The ZAE-Oil Palm aims to facilitate the agro-ecological, sustainable, low-impact production of oil palm products, including palm oil for human consumption and use as a biofuel. Areas already deforested in the Amazon region are the target for this type of zoning.

The agro-environmental zoning was established considering two types of technology in terms of the management of oil palm plantations: one with significant capital investment and technology use, and the other with less investment and less use of technology.

The ZAE-Palm Oil takes into account information on soil, climate and protected areas. The zoning seeks to classify and map areas favorable for oil palm cultivation, including areas deforested prior to 2007, according to the PRODES methodology developed by Brazil's National Institute of Space Research (INPE). It also aims to safeguard potential protected areas and indigenous lands within the landscape.

The level of zoning is categorized according to the degree of environmental limitations (climate and terrain) for oil palm cultivation: Preferred - P (good potential); Regular/Moderate - R (average potential); Marginal/Low - M (low potential); Inappropriate - I (very low potential).
Figure 3.5 shows the Map of the Agro-Ecological Zoning for Palm Oil – Management Class B.

Ecological-Economic Macro-Zoning in Pará State

State law No. 6745, May 6, 2005, instituted the Ecological-Economic Macro-Zoning for the state of Pará. Article 5 of the law states that, "The zone destined for consolidation of productive activities must include areas with great human impact (anthropization) or that have been otherwise environmentally degraded, and subject to comprehensive ecological-economic zoning according to the priorities set by the executive branch of government, subject to applicable laws." Article 9 further specifies that protected areas can be created within areas to be used for the consolidation or expansion of productive activities, or areas designated for restoration and recovery.

In keeping with annex 4 of the macro-zoning law, ADM's project is classified in what are designated as agricultural areas to be consolidated and areas in expansion with the following land management strategies:

- Private land with medium level investments, such as those involving agricultural production. This includes rural settlements which fall under the jurisdiction of the National Institute for Colonization and Agrarian Reform (INCRA).
- Private land with intensive investments, such as those designated for agricultural production. Areas of secondary re-growth should be restored. The region also includes rural settlements under jurisdiction of the INCRA.

According to the Ecological-Economic Macro-Zoning of the state of Pará, the project area is located in areas designated for consolidation and expansion of productive activities.

Figure 3.4 presents the Economic Ecological Zonning Map of Pará - 2007.

Ecological-Economic Zoning of North Channel and East Zone in Pará State

State law No. 7398, April 4, 2010, instituted the Ecological-Economic Zoning of North Channel and East Zone in Pará State. The zonning was prepared in accordance with the Land Management map presented on the scale of 1:250,000, based on data and maps of watershed, legally protected areas, social potential of territorial units, natural vulnerability to erosion, of public consultation, development axis , land use, settlement projects, the state Macro-Zoning, among others. The Ecological Economic Zoning aims at regional development, establishing the foundation of the state public policy planning.

Article 5 of the law states that three major land management units - management areas, subdivided into "management zones"

According to the zoning Annex 1, the ADM project area is classified in the category of consolidated used areas and/or in consolidation, where the use of natural resources may ensure, by increasing incorporation of technical progress, better livelihoods for populations. Within such management area, the Palm Oil project area is in the Management Zone classified as Consolidation II, defined as:

- Area with natural stability from medium to high, but has low socio-economic potential, due to social, technical, productive, infrastructural and institutional deficiencies, indicating the need for consolidation of the productive structure, seeking higher levels of value and investment in physical and social infrastructure and to generate strengthen supply chains compatible with your natural potential.

Article 8 states that for rural properties located in the areas of consolidated use or to consolidation, is indicated resizing, for recovery purposes the legal reserve up to 50% of the property, under the current legislation, by the requirements of:

• Environmental regularization with the state environmental agency and its entry into the Rural Environmental Registry.

• Commitment recovery or regeneration of riparian areas.

• Regularization of Legal Reserve.

Brazilian Forest Code

It is noteworthy aspects of the current Brazilian Forest Code - Law No 12651, with last update by Law No 12727, October, 17, 2012, which applies to rural properties. Refers to the Permanent Preservation Areas (PPAs) and Legal Reserve Areas (RL).

The Forest Code requires, for this region, according to the provisions of Ecological Economic Zonings the presence of 50% of Legal Reserve in the properties and the maintenance of APP as follow:

I – Water bodies must have a minimum green belt of:

- 30 meters for rivers 10 meters wide;
- 50 meters for rivers from 10 to 50 meters wide;
- 100 meters for rivers from 50 to 200 meters wide;
- 200 meters for rivers from 200 to 600 meters wide and;
- 500 meters for rivers over 600 meters wide.

II - areas around natural lakes and or ponds must have a minimum width of:

- 100 meters, in rural areas, except for those with less than 20 hectares of surface area, where greenbelts can be reduced to 50 meters ;
- 30 meters, for lakes and ponds in urban areas;

III – in areas surrounding man-made reservoirs resulting in damming of waterways, the greenbelt is defined by the environmental permit for the activity;

IV – In natural or artificial accumulations of water with a surface area of less than one hectare, green belt requirements are waived, according to sections II and III of the clause, but the suppression of native vegetation is prohibited, unless authorized by the environmental agency of the National Environmental System (Sisnama).

For smallholders (properties with up to 4 fiscal modules), and 1 fiscal module in the municipalities of the area is 55 ha, in other words, properties up to 220 ha, the forest code indicates that it is allowed add up the areas of APP for the composition of 50% of Legal Reserve. Even more, the recovery actions and use of RL can be performed by planting perennial native species (e.g. fruit) and/or agroforestry systems (AFS).

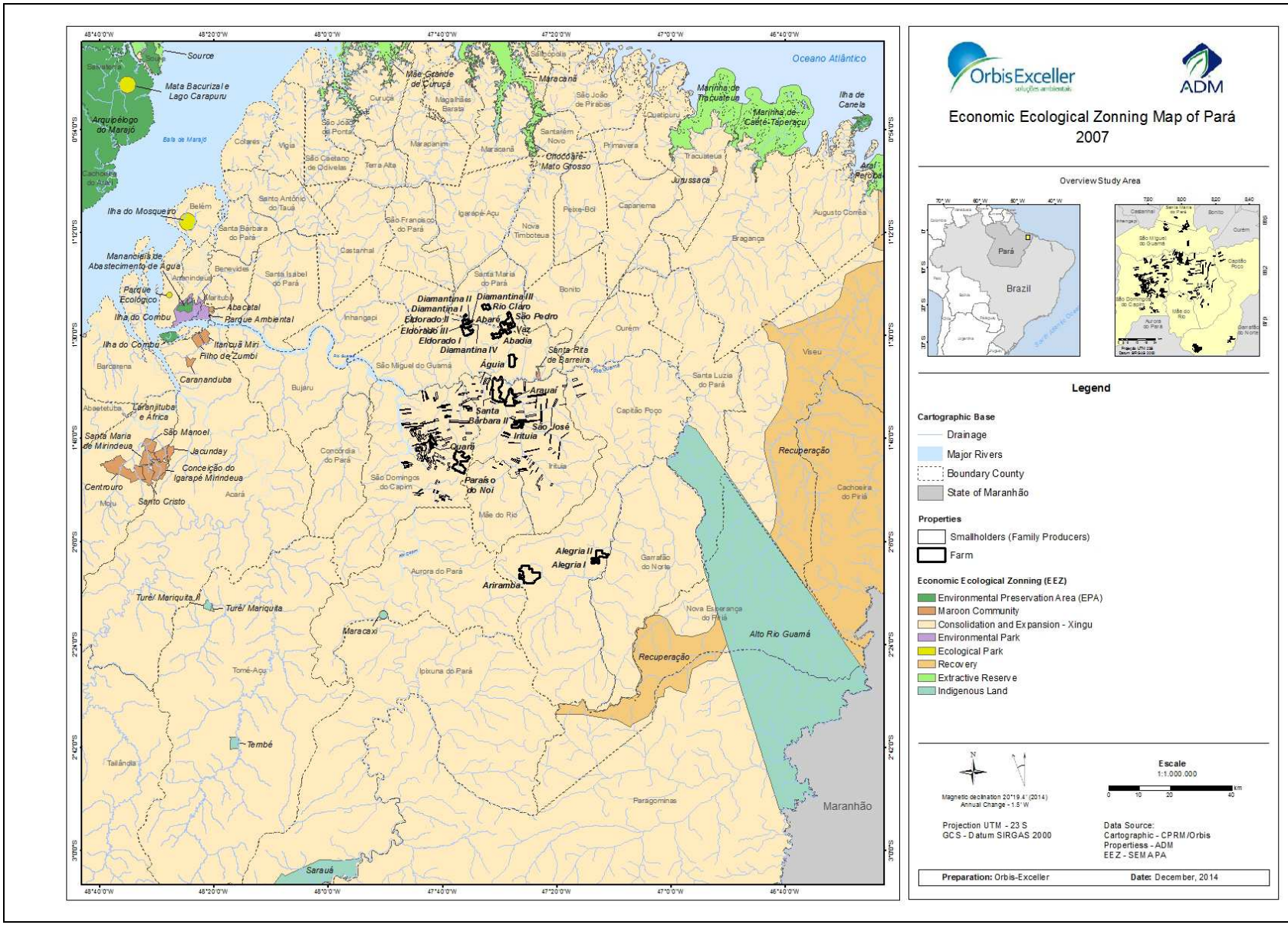


Figura 3.4 - Economic Ecological Zonning Map of Pará - 2007.

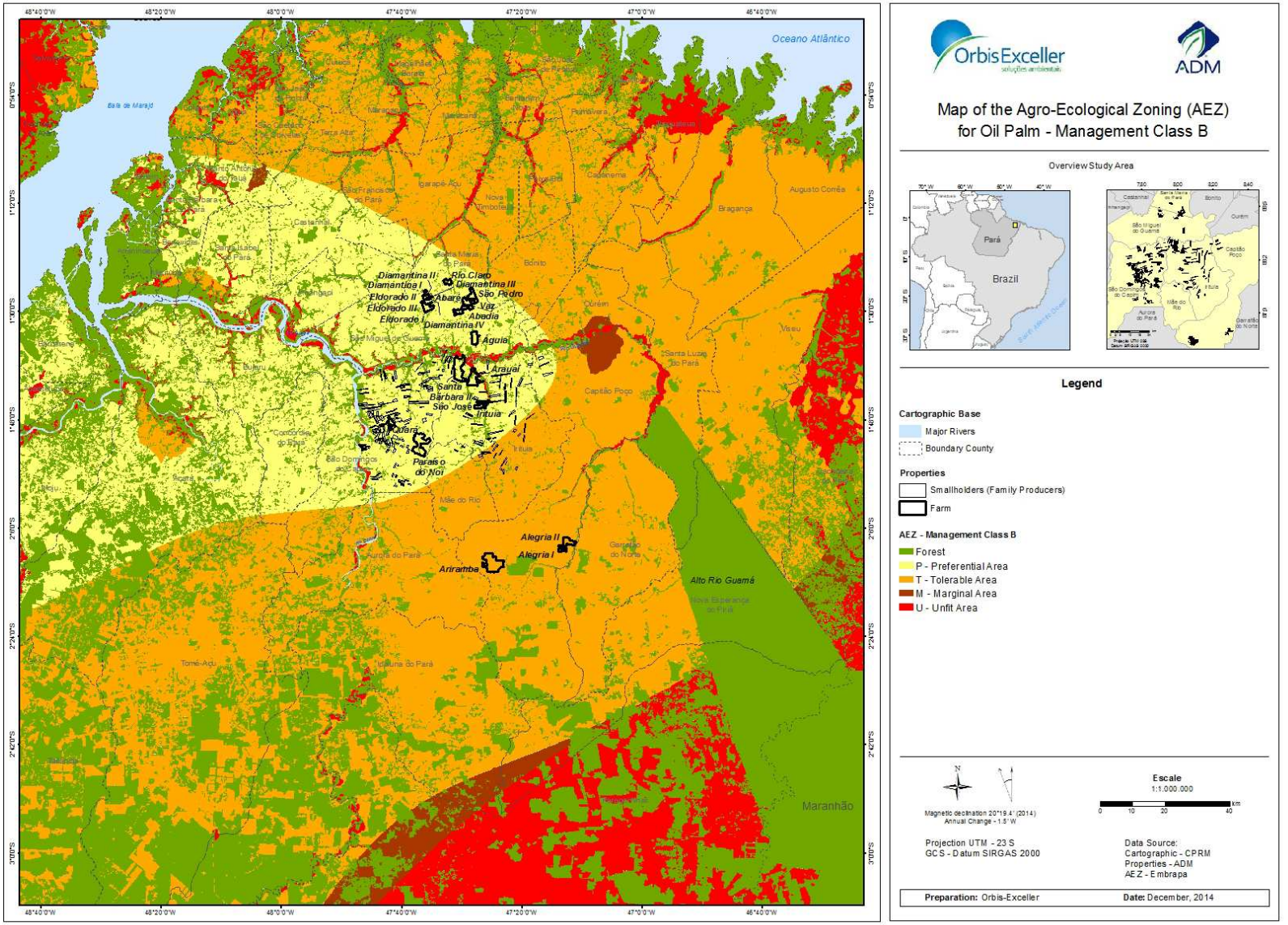


Figura 3.5 - Map of the Agro-Ecological Zoning for Palm Oil – Management Class B.

3.2. Area of Planting and Timing-Plan

Table 3.1 shows the business partnership properties, smallholders, total area, contracted area, planted area, suitable planting area and planting timetable. Appendices 1 and 2 present the complete list of smallholders.

Table 3.1 - List of properties and planting timetable.

Properties	County	Total Area (ha)	Contracted area	Planted área (palm oil + roads) (ha)	Legal Permitted Area (Rural Environmental Registry)	Planting timetable
Farm Santa Bárbara II	Irituia	1926,78	600,00	405,44	912,8	2012
Farm São José	Irituia	194,98	165,00	37,32	72,8	2012
Farm Irituia	Irituia	408,52	200,00	127,66	190,74	2012
Farm Arauai	Irituia	1222,1	600,00	335,00	505,69	2012
Farm Paraíso do Noi	São Domingos do Capim	1962,65	540,00	523,88	981,32	2013
Farm Rio Claro	Santa Maria do Pará	324,40	148,00	151,16	159,37	2013
Farm Alegria I	Capitão Poço	210,65	134,37	154,96	156,47	2014
Farm Alegria II	Capitão Poço	739,03	497,37	410,69	497,76	2014
Farm Ariramba	Capitão Poço	2166,02	1972,00	1948,39	2080,02	2013/2014
Farm Eldorado I	São Miguel do Guamá	654,68	326,00	366,32	327,34	2013
Farm Eldorado II	São Miguel do Guamá	25,44	25,00		23,38	2013
Farm Eldorado III	São Miguel do Guamá	51,94	49,00		46,38	2013
Farm Quara	São Domingos do Capim	275,05	137,00	134,17	140,49	2014
Farm Abaré	Santa Maria do Pará/ São Miguel do Guamá	456,17	174,00	145,50	350,92	2014
Farm Abadia	São Miguel do Guamá	717,58	119,00	117,27	559,26	2014
Farm Diamantina	São Miguel do Guamá	309,52	181,00	172,56	223,99	2014
Farm Águia	São Miguel do Guamá	639,05	317,56	293,98	321,45	2014
Farm São Pedro	Santa Maria do Pará	532,65	120,00	94,08	490,45	2014
Smallholders	São Domingos do Capim e Irituia	-	1102,00	1102,00	1102,00	2012
Smallholders	São Domingos do Capim, Irituia, Capitão Poço e Mãe do Rio	-	927,90	927,90	927,90	2013
Total Busines Partnership	-	**12.817,21**	**6305,30**	**5418,39**	**8040,62**	-
Total Smallholders	-	**15.267,00**	**2029,90**	**2029,90**	**2029,90**	-
Total	-	**28.084,21**	**8335,20**	**7448,29**	**1070,52**	-

The total areas refer to complete areas of properties, including used areas, legal reserves, permanent preservation areas (PPAs), roads and other uses. Contracted areas refer to areas (ha) negotiated with landlords in business partnerships. The suitable planting area (farmland) is the area suitable according to soil and slope, excluding the areas of Legal Reserve, PPAs and areas of HCV, it is the legal permitted areas indicated by Rural Environmental Registry. Planted areas refer to palm oil planted areas and roads. It is noteworthy that according to current Brazilian legislation (Forest Code Law 12,651, with last update by Law 12,727), the properties of business partnership must contain 50% of areas corresponding to the legal reserve. This area can be set aside on the property itself or elsewhere in the same biome, according to the environmental licensing system (obtaining Rural Environmental Registry - CAR and License of Rural Activity - LAR).

4. ASSESSMENT PROCESS AND PROCEDURES

4.1 Social Environmental Impact and HCV Assessors with their credentials

The Social and Environmental Impact and High Conservation Value assessment was carried out by a team of eight specialists with training and background in the Amazon region and social and environmental impact assessment and HCV of the palm oil production. The team and its roles are presented in table 4.1.

Table 4.1 – Team of the Social and Environmental and HCV Assessment

Name	Career	Speciality	Role
Arthur Wieczorek	Ecologist	MSc. Geoscience and Environment. Specialization in Environmental Sciences Applied to Oil, Gas and Biofuels. RSPO-HCV Assessor – Team Leader	Team Leader Physical Environment - Water Resources Geoprocessing HCV assessment and managment HCV Smallholders (SHARP/PROFOREST) Simplified HCV approach for smallholders
Ghislaine Medeiros de Almeida	Geologist	MSc. Environmental Geology and Hydrogeology	Physical Environment – Geomorphology, Water Resources
Paulo Rubim	Ecologist	MSc. Botany.	Biotic - Vegetation HCV assessment and managment
José Admilson da Costa Souza	Forester	Para-botany	Biotic - Vegetation HCV assessment and managment
Elinete Rodrigues	Biologist	MSc. Zoology	Biotic - Birds HCV assessment and managment
André Luis Ravetta	Biologist	MSc. Zoology	Biotic – Mammals HCV assessment and managment
Rosenira Siqueira	Economist	MSc. Smallholding Development	Socioeconomic

Daiana Costa	Geographer	MSc. Geoscience and Environment	Socioeconomic and Geoprocessing HCV assessment and managment
Gabrielle Lambrick	Biologist	Technical Report	Proofreading
Daniel Arancibia	Forestry Science	MBA in Business and GIS for environmental management, forest and biodiversity	HCV Smallholders (SHARP/PROFOREST) Simplified HCV approach for smallholders

4.2 Assessment Methods used in the Social Environmental Impact Assessment and HCV

The study of social and environmental impacts and HCV was carried out in 4 stages. In stage 1 and in stage 3, areas of HCV were assessed, free, prior and informed consent was obtained, and advice on the preparation of planting areas was given, prior to land preparation for the new planting to be performed by ADM. These stages took place in 2013 and 2014 respectively. Stage 2 involved an assessment of the project's impacts and HCVs at the landscape scale. Stage 4 involved mapping of smallholdings and calculation de HCV areas, consultations for identification, threats and management of HCVs, and was carried out in 2014.

The assessment process in Stage 2 consisted of three steps. Step 1 involved gathering all the secondary information on the region, including maps and geographical databases relating to soils, geomorphology, water resources, vegetation, fauna, flora, and government data used to characterize the socio-economy of the municipalities. Some of the geographical information gathered was outdated and were updated from a database of satellite images from 2005 to 2013. The second step was the field assessment. At this step, all business partnership properties were visited and interviews were held with a proportion of the smallholders. The field assessment was carried out by a multidisciplinary team in December 2012 (5 days), March 2013 (12 dias) and January 2014 (5 dias), and November/December 2014 (6 days), obtaining the following information:

- Soils – assessment of fragile and peat soils, sampling and analysis of grain size, fertility and herbicide residues;
- Geomorphology – slopes and land cover;
- Water resources - sampling and analysis of water quality;
- Vegetation - assessment of the status of the vegetation in the areas for planting and vegetation survey in forest set aside (Legal Reserves), with emphasis on the identification of threatened, endangered, rare and endemic species;
- Fauna – survey of Birds and Mammals, with emphasis on the identification of threatened, endangered, rare and endemic species;
- Local communities - consultation and workshops with communities and smallholders about the impact of the activities and HCVs.
- Stakeholders (local institutions) - consultation with local government institutions (county departments, rural unions, community leaders and associations of smallholders);
- Field workers - interviews with field workers in agricultural activities.

The third stage consisted of the gathering and organization of the information collected, the evaluation and interpretation of data from laboratory analyses, and the assessment of

historical land use since November 2005 in the areas of planting, HCV classification, mapping and reporting.

The following sections detail the methods of assessment for each area studied - Physical Environment (geomorphology, soil and water resources); Biota (vegetation, birds and mammals), Land Use (analysis of land use in planting areas after Nov. 2005); Socio-economic (gathering of secondary data, consultations with communities, institutions, smallholders and field workers), and HCV (criteria of analysis and classification of HCVs).

Geographic Database and Thematic Mapping

For imaging areas of the palm oil plantations, satellite images were acquired from the *Landsat 5* Satellite Sensor TM + and DMC International Imaging, whose catalog of images is available and accessible for public access by the Brazilian National Institute for Space Research – (*INPE*).

The vector data were acquired by means of secondary sources; they are those necessary for the preparation of cartographic base mapping. Available data from official bodies were consulted, such as the Brazilian Institute of Geography and Statistics (*IBGE*), the Geological Survey Institute of Brazil (*CPRM*), the Ministry of the Environment (*MMA*), the Department of the Environment of the State of Pará (SEMA-PA), the Ministry of Transport (MT) and data from Archer-Daniels-Midland Company (ADM).

The data were processed and adjusted using digital processing to compose an integrated database. This involved georeferencing files, defining the projection and datum systems, checking the compatibility of scales, generating shapefiles, building and editing tables, and so on. The field data were collated from spreadsheets and the data were standardised for insertion into the digital database.

The thematic mapping was developed from the analysis of charts that covered all areas of the project in the municipalities of Santa Maria do Pará, São Miguel do Guamá, São Domingos do Capim, Irituia, Capitão Poço, Mão do Rio and Aurora do Pará. Ten maps were prepared for Step I and Step III and 36 maps at different scales, as shown in tables 4.2 and 4.3.

Table 4.2 - maps prepared in step I, scales, type and layout.

Map Title	Type	Layout	Scale	Quantity
Overview Map of Properties	General	A3	1:330.000	1
Drainage Map	General	A3	1:330.000	2
Soils Map	General	A3	1:330.000	1
Vegetation Map	General	A3	1:330.000	1
Land Cover Map between 2006 - 2012	General	A3	1:330.000	1
Land Cover Map between 2006 - 2012	Particular	A3	1:170.000	4
Total				**10**

In the second step, after the fieldwork had been carried out, it was possible to review all the information contained in the maps of the first stage and 36 new maps were produced, as shown in table 4.3.

Table 4.3: Maps prepared in Step II, scales, type and layout.

Map Title	Type	Layout	Scale	Quantity

Table 4.3: Maps prepared in Step II, scales, type and layout.

Map Title	Type	Layout	Scale	Quantity
Drainage Map	General	A3	1:350.000	1
Geomorphology Map	General	A3	1:350.000	1
Infrastructure Map	General	A3	1:350.000	2
Overview Map of Properties	General	A3	1:350.000	1
Soils Map	General	A3	1:350.000	1
Map of Water Sampling Points	General	A3	1:350.000	2
Map of Soil Sampling Points	General	A3	1:350.000	2
Map of Biotic Sampling Transects	General	A3	1:400.000	2
Land Cover Map	General	A3	1:350.000	1
Vegetation Map	General	A3	1:350.000	1
Map of Roads	General	A3	1:350.000	2
Map of Unit Conservations	General	A3	1:1.000.000	1
Map of Indigenous Lands and Maroons	General	A3	1:1.000.000	1
Mapa de Zoneamento Ecológico Econômico do Pará	General	A3	1:1.000.000	1
Mapa de Zoneamento Agroecológico de Dendê ZAE - Classe de Manejo B	General	A3	1:1.000.000	1
Mapa de Zoneamento Agroecológico de Dendê ZAE - Classe de Manejo C	General	A3	1:1.000.000	1
Economic Ecological Zonning Map of Pará - 2007	Particular	A3	1:25.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farms Alegria I e II	Particular	A3	1:35.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Ariramba	Particular	A3	1:45.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farms Eldorado I, II e III	Particular	A3	1:45.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Flexal	Particular	A3	1:25.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Santa Bárbara II	Particular	A3	1:65.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Irituia	Particular	A3	1:25.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Arauai	Particular	A3	1:45.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Paraíso do Noi	Particular	A3	1:60.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Quara	Particular	A3	1:34.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Rio Claro	Particular	A3	1:25.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm Abaré and Abadia	Particular	A3	1:40.000	1
Land Cover Map between 2006 - 2012 betwen 2006 e 2013 - Farm São Pedro	Particular	A3	1:25.000	1
Map of High Conservation Values Areas (HCV) - landscape-level	General	A3	1:350.000	1
Maps of High Conservation Values Areas (HCV) Business partnership and smallholdings	Particular	A3	1:25.000	40

Geomorphology

For the physiographic characterization of the region, fieldwork was carried out and regional maps were created. Analyses of landforms, ocurrences of mass movements and erosion were performed (Appendix 3).

Soils

The soil assessment was performed using two approaches. In the first, regional, approach the major soil types of the area covered by the project were mapped (Appendix 4). The second approach was to evaluate, for the properties of business partnerships and smallholders, the physical characteristics (grain) (Appendix 5) and chemical soil properties (CEC) (Appendix 6). Such analysis allows, in the case of physical properties (grain size), the estimation of regional spatial differences that can differentiate areas of susceptibility to erosion.

The soil chemical analysis has two purposes. The first is to characterize, at an early stage of the project, such chemical properties as can be monitored over the long term, so as to pick up any changes of these soil properties over the lifespan of the plantation. The second, more important purpose, is to characterize and spatialize the parameters of soil fertility. In other words, to provide estimates of the spatial distribution of the soil fertility.

Thus, it is possible that such analyses can contribute to better planning for soil fertilization, by evaluating spatial differences of soil fertility according to the demands of the crop. It is possible that with such analysis, and the subsequent implementation of a regular soil and leaf sampling and analysis of the plantation, a system of precision agriculture could be deployed, and the soil fertilization could be optimized.

Optimization of fertilization has direct economic consequences for the oil palm plantation, as this is one of the biggest costs of the activity. It also has environmental consequences, since a decrease in the use of inputs helps to avoid possible contamination of water supplies. Moreover, the decrease in the fertilization consumption decreases the overall carbon footprint of the activity.

Quantitatively, soil samples were performed for physical and chemical analysis of the soil at 22 sites distributed among the properties of business partnership and smallholders (Appendix 7).

Another parameter evaluated in soils was the possible presence of residues of glyphosate, which is the herbicide most frequently used on fodder crops (grass of cattle grazing). Soils from the properties in production and water from the rivers and streams under the influence of plantations were analysed for this contaminant and its degradation product (aminomethylphosphonic acid - AMPA). The other soil parameters analyzed were physical parameters (grain size); chemical (pH, Organic Matter, Phosphorus, Potassium, Calcium, Aluminum, Cation Exchange Capacity CEC, among others); Micronutrients (Copper, Zinc, Manganese and Iron); and the analysis of glyphosate and AMPA. These parameters will be used as a baseline, enabling future changes in these chemicals to be monitored.

Water Resources

The assessment of water resources has been conducted using a regional approach, where the main water resources of the area covered by the project were mapped (rivers and streams) (Appendix 8). Hydrological analysis of precipitation (rainfall) and fluviometria (river flows) were also performed using the same approach, with assessment of available historical series. A local approach was also used to evaluate the surface water quality of the areas under the direct influence of the activity.

The assessment of the current situation of water resources and quality status of surface water was drawn from qualitative and quantitative analyzes. The major rivers and streams that cross the properties of the project and the areas of smallholders, or that feed the River Guamá, near the city of São Miguel do Guamá, were identified, in order to assess their current status and the possible impact on water quality of the deployment of palm oil cultivation by ADM.

Since the planting of palm oil requires no irrigation (except for nurseries), impacts to water resources are due to possible changes in the surface water quality of rivers and streams that cross areas in production. Therefore, we sought to evaluate possible changes related to solids and sediment, and the presence of contaminants from fertilizer, oil and grease, and fecal and total coliforms. During land preparation, there is increased road construction and a subsequent increase in moving vehicles intended for crops and harvest. These activities may contribute to increased sediment, especially in the early years of the project. Appendix 9 shows the sampling points for water analysis.

Another aspect evaluated was the possible presence of residues of glyphosate. Levels of this compound and its degradation product (AMPA) were evaluated in surface water in the properties and in the rivers and streams under the influence of plantations.

Water bodies under the influence of current and potential areas in production were sampled. Points upstream and downstream of these areas were analyzed, when possible. The water quality parameters analyzed consist of physico-chemical parameters, microbiological indicators and analysis of glyphosate + AMPA, giving a comprehensive picture of the water quality. This will be used as a baseline for future monitoring and will inform the use of mitigating measures as may be necessary.

Vegetation

The land use and vegetation present in the areas for planting were evaluated by fieldwork in all areas for planting. Sampling of areas with presence of vegetation was carried out (Appendix 10).

In order to assess the status of forest fragments present on set aside forest and the assessment of HCVs, vegetation surveys were conducted in forest remnants of properties intended for production. These remnants represent a reasonable sample of forest fragments present in the region, and the ecological parameters measured can be extrapolated to other possible remnants of the region.

The remaining forest fragments of the properties are composed of upland rainforests in secondary stage due to the intervention of logging. Areas in early stages of regeneration were also assessed, as the vegetation currently consists of mosaics of fragments in different successional stages. The aim was to characterize the regional floristic composition (Appendix 11).

The fieldwork was conducted in December 2012 and January 2014 to assess the areas for planting in 2013 and 2014, respectively. The assessment of areas of forest remnants was held from 05 to 15 March 2013, in ten farms.

In the areas of forest fragments, 67 plots were sampled. These were distributed over 10 transects in the vegetation of the remaining forest fragments of ten farms, totaling 6,700 m² (Appendix 12). The forest fragments were sampled on the following farms: Arauai, São José, Irituia, Santa Bárbara II, Eldorado, Fazenda Rio Claro, Paraíso do Noi, Agropecuária Capim, Ariramba and Santa Barbara.

The plots have a dimension of 10 x 10 meters, distributed linearly along the transects with a distance between them of 100 and 150 meters, depending on the size of the fragment. In each plot, all individuals with a diameter at breast height (DBH) ≥ 10 cm were identified to genus or species level, and measurements of DBH and estimations of height were recorded.

To characterize the richness and density of regenerants and typical species of the understory, plots of 1 x 1 meter were located randomly at the corner of every major plot, where all individuals with DBH <10cm were identified. For the identification of species, guides to Amazonian botany, such as Ribeiro et al. (1999), Oliveira (2001) and Lorenzi (2012) were used, in combination with the knowledge of an experienced parataxonomist.

Additionally, the assessment of HCV identified endangered, rare and threatened species according to the Secretary of State and the Environment of Pará (SEMA 2007), Normative Instruction of the Ministry of Environment (IBAMA 2008) and the Red List of Threatened Species (IUCN 2013). All in all, exhaustive search methods were used throughout the field survey, including sampling, identifying, mapping the site of occurrence and estimating density when appropriate.

Fauna

The fauna surveys (birds and mammals) were conducted in the period of 05 to 15 March 2013. The sampling locations were the same transects used for the botanical survey (Appendix 12).

Bird sampling was carried out using the methodology of the Standardized List of Mackinnon. Standardized sequential lists of 10 species were compiled. Each list was considered a sampling unit and was used in the preparation of rarefaction curves.

To estimate the species richness of the sampled communities, non-parametric methods provided by EstimateS software (Cowell, 2009) were used.

Samples were taken in the morning (7:00 to 12:00) and in the afternoon (16:00 to 18:00). Identifications were made based on the relevant literature (Ridgely and Tudor, 1994; Sigrist, 2008; Souza, 2002).

During sampling, recordings of bird vocalizations were performed to elucidate any doubts on the identification of some species. For this, specialised recording equipment was used.

The secondary data of birds used Aleixo *et al.* (2008), and Portes *et al.* (2009). The data from the ornithological collections of the Goeldi Museum (MPEG) was another source of secondary information. In total, 529 bird species potentially distributed in the influence area of plantations were listed. Secondary data were compared qualitatively with the primary data of these surveys, being used to measure the reduction or increase of diversity. The taxonomic nomenclature and common names adopted followed the recommendations of the Brazilian Ornithological Records Committee (CBRO, 2011).

The survey of mammals followed standard methodology based on line-transect surveys and traces used in most studies of mammal populations (Brockelman & Ali, 1987; Wemmer *et al*, 1996; Rudran & Cullen, 2006), especially those conducted as Rapid Ecological Assessment, RAP (TNC, 2003). The line transect method consists of going through the transect carefully at a constant speed of approximately 1.5 km/h, recording the presence of mammals. In each encounter, the following data are recorded:

- Time and location on the transect;
- Detection type of encounter (auditory or visual);
- Species;
- Height of first animal spotted on the ground (for arboreal species);
- Group size (for social species);
- Age and sex composition of the group (male or female; adult, immature or young);
- Behavior of the first animal sighted (rest, shift/escape and foraging);
- Other relevant information (food item consumed, associated species).

The survey was conducted in the morning (07:00 to 11:00), and also in the afternoon (15:30 to 18:00), using 8x40 binoculars and a digital camera to record sightings. On the way to the sampling areas and within them (forest), all traces were recorded and photographed with metric scale.

In many cases, the presence of mammals can be detected only through traces (tracks, feces, holes, substrates, skulls, claw marks, vocalizations, and odors), which may be visual, auditory or olfactory (Wemmer et al. 1996). Species data based on traces of the animals are an alternative to population surveys, and a very fruitful way to enrich the list of species in a sample area. By the presence and identification of mammals' traces, the presence of a species in an area can be confirmed, and data obtained on their local abundance (Wemmer et al, 1996; Riordan, 1998).

Identifying footprints can generate information about the presence of young, while the examination of feces provides evidence of the relationship between predator and prey, which may characterize the occurrence of two or more species in a single sample. Samples of carcasses, skulls, skin and hair may be used to confirm sightings of certain species

Land Use in Areas for Planting and Replacement of Vegetation

To assess compliance with Principle 7 of the RSPO standard, specifically Criteria 7.3 "New plantings since November 2005 have not replaced primary forest or any area required to maintain or enhance one or more High Conservation Values" land use on the business partnership properties since November 2005 was mapped from a time-series of satellite images.

This step consisted of more refined mapping of land cover for the analysis of possible deforestation after November 2005 in the properties for palm oil plantations. For this purpose, the property boundaries provided by ADM were used, along with the limits of the legal reserve, the permanent preservation area and the areas for planting, when available.

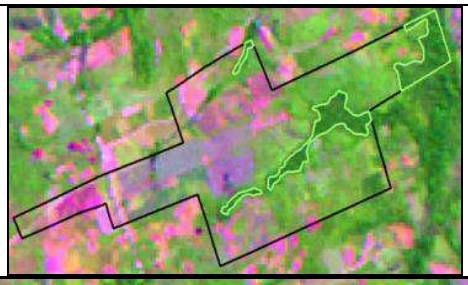
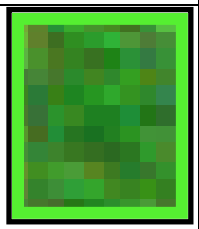
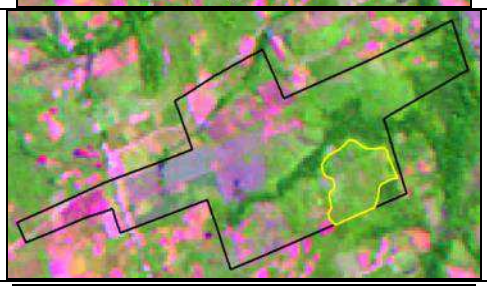
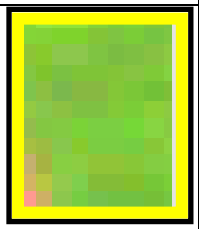
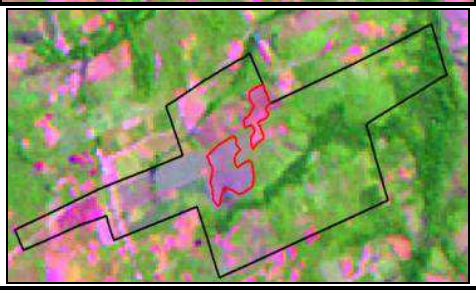
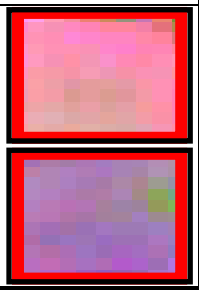
LANDSAT satellite images and DMC on different dates and orbits were used, as close as possible to the reference periods (2005-2013). Images with low cloud cover were chosen for this.

The land cover interpretation was based on visual identification of vegetation categories (exposed soil, cattle grazing, initial secondary vegetation, late secondary vegetation) in the period between the years 2006 and 2013, and later in the mapping of replaced areas in the same period. Although criterion 7.3 of the RSPO indicates November 2005 as a reference, it is known that deforestation in this Amazon region is conducted in the dry season, which runs from July to December, so it is reasonable to assume that in the period from November 2005 to July 2006 (the date of initial analysis of land cover) there was little deforestation in the region. The period of August/September 2006 provided the best available images due to low cloud cover.

The assessment of forested areas was based on the presence of woody, continuous and large vegetation, indicated by dark green and rough texture. The areas that showed variation in color (light yellow and green), indicate regenerating forests, high-intensity degradation, and/or agricultural crops. Areas with colour variations between red, pink and purple indicate bare soil. Table 4.3 illustrates this interpretation.

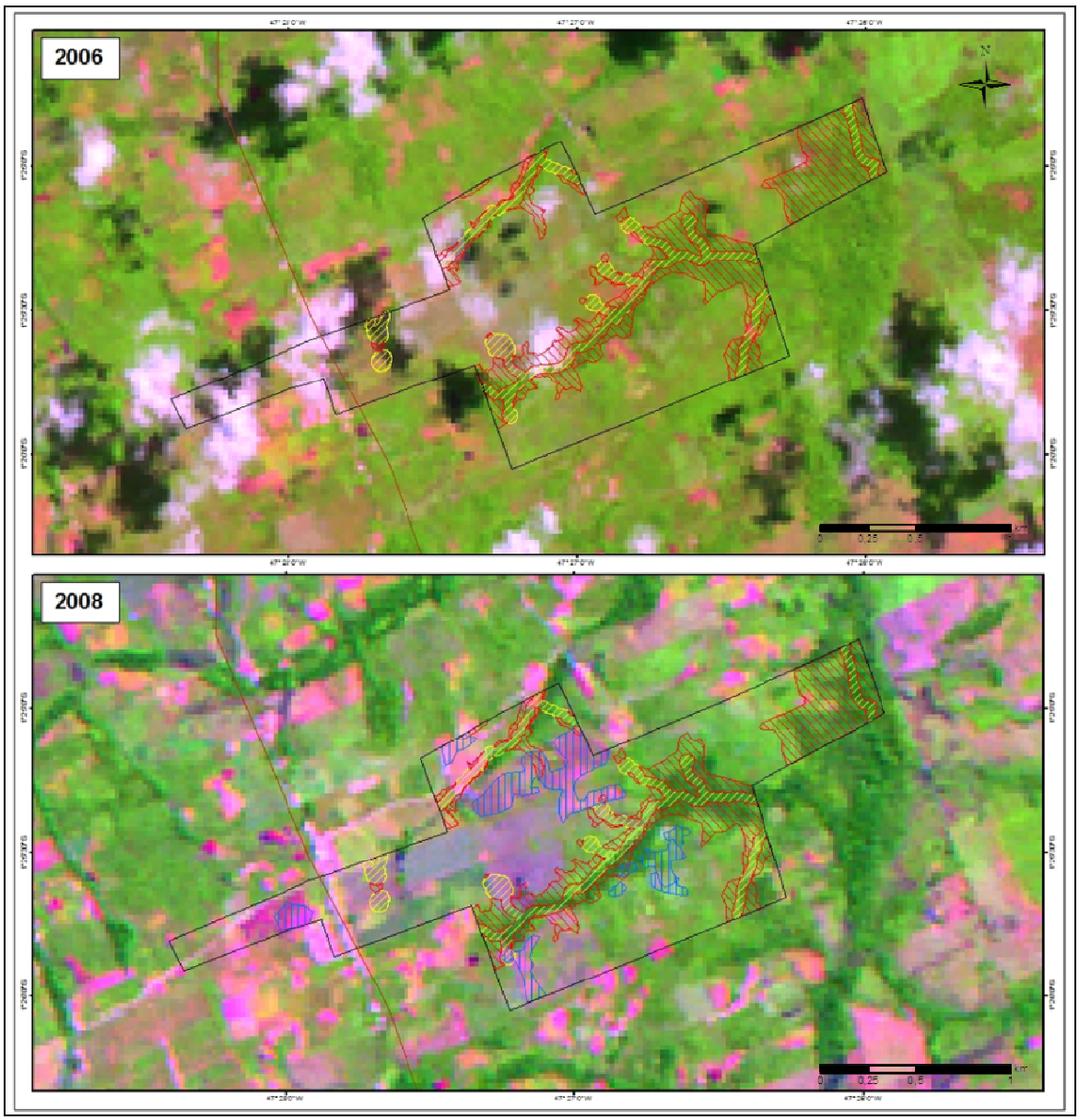
To identify the use and replacement of land use on the properties of smallholders in the period, it was not possible to perform the same approach of using time series of satellite images, due to the small size of smallholders plots (20-100 ha), LANDSAT images resolution do not allow this analysis accurately. In this case, consultations were held with smallholders individually and in groups and analyzed the selection process records and implementation of plantations with smallholders by ADM.

Tabela 4.3 - Example of visual interpretation, municipality of Santa Maria do Pará, 2008.

Orbital Image	Pixel	Photo	Description
			Dark green and rough texture: forested area
			Light green: area with high intensity degradation; regenerating forests (secondary vegetation) and/or crop
			Red, pink and purple colour: bare soil

Identifying these patterns in the images of each year, for each property, its possible to compare them and outline the areas that showed some clearing of vegetation. Figure 4.1 shows an example of this interpretation.

Figura 4.1: Sample delimitation of deforested areas, comparing the years 2006 and 2008. Showing the polygons of the forest set aside (legal reserve areas - red), riparian forest (permanent preservation - yellow) and vegetation replacement (blue).



Socio-economic Informations of Municipalities

Statistical data on the socio-economic aspects of the state of Pará were compiled from the Agriculture Census 2006 and 2010. The data acquisition was performed using the IBGE system of auto recovery (CIDER). The topics below were analyzed (using historical series where possible) for municipalities in the project area:

- Demographics (population and ratio of men:women);
- Economy (GDP and employment);
- Agriculture (production data of the main temporary and permanent crops);
- Livestock;
- Family Agriculture;

- Farm loans;
- Education;
- Health;
- Sanitation;
- Public Safety;
- Human Development Index

Consultations with local institutions

Consultations were carried out with local institutions (county departments, agencies of rural technical assistance, farmers' unions and agricultural cooperatives).

Twenty five institutions were visited in the period of 04-15 March 2013, in the cities of São Miguel do Guamá, São Domingos do Capim, Irituia and Mão do Rio. The institutions which were interviewed in each county, the names of the representatives and their respective contacts are presented in Appendix 13.

The interviews were based on a previously used script. The consultation addressed issues such as the generation of income and employment, migration, demand for services and infrastructure, housing, health, education, transportation, security, prostitution, drug abuse and environment. These questions were designed to identify the vision of government institutions in relation to modes of palm oil production development in the municipalities.

The aim of this assessment is to identify and assess potential interference, to monitor different parties' actions and responsibilities, and to identify potential partners for the implementation of control measures that should be adopted to ensure the project's sustainability.

Consultations with stakeholders (Rural Workers)

The rural workers of the properties of business partnership, during the performance of SEIA/HCV study, were subcontractors for land preparation, planting and cultivation of palm oil. Approximately 70 rural workers were employed, of whom 8 (11.43%) were interviewed. The interviews took place during working hours in the farm Arauai. The consultations sought to characterize the way of life of workers, the working relationships and the positive and negative aspects of the palm oil work from their point of view.

Consultations with local communities, stakeholders and smallholders

Consultations were performed with 6 communities located near the properties of business partnerships which are to produce palm oil. We attempted to consult community leaders, who could indicate potential conflicts of land use or potential impacts generated by the activity. The consultation always sought a male and female leader to ensure gender diversity in opinions (Appendix 14).

In the case of smallholders, the consultation took place in three stages. The first was in the period 10 to 14 December 2012, when potential new smallholder partners of the project were consulted.

13 family potential partners were sampled, and interviews were conducted in order to obtain information about the free, prior and informed consent to planting palm oil, and her/his knowledge about the partnership with ADM. The objective of this consultation was to verify compliance with 7.5 RSPO criteria. Status of the areas suitable for planting was also conducted, assessing the vegetation, soil and possible HCVs present in these areas. Interviews with

community leaders were also conducted, in order to ascertain the views of those involved in the deployment process of palm oil plantations in the communities.

In the second stage, held in March 2013, interviews were performed with smallholders who are already partners in palm oil plantation with ADM and the ones who would possibly join this partnership. In this step, a sampling of smallholders was conducted and 9 current partners and 11 possible smallholder partners were interviewed, totaling 20 respondents (Appendix 15).

The smallholders consulted at that step are located in a total of 20 communities that are part of the municipalities of São Domingos do Capim e Irituia, and are 10 km distant from the district headquarters.

The communities located in the municipality of Irituia are: Canaã, Itabocal, Lago, Perpétuo Socorro, Santa Luzia da Brasileira e Santo Antônio do Maneta. The communities located in the municipality of São Domingos do Capim are: Ajará, Belazinha, Catita, Bom Jesus, Nossa Senhora do Perpétuo Socorro, São João de Botafogo, Itabocal, and São Pedro do Cunarijó.

Standardized questionnaires were prepared in order to obtain information regarding: the process of selecting new smallholders, their knowledge of the contractual terms, smallholders' economic condictions, agricultural production, livestock, income, education, quality of life, contract, associations, training in the cultivation of palm oil, communication relationship with ADM, and health and safety at work. The questionnaires also contained specific points in HCVs, approaching the presence of threatened, rare or endemic fauna and flora species, hunting, forest fragments on the properties, status of vegetation used for conversion into palm oil plantations (scrubland, secondary vegetation), use of essential resources such as water, wood, firewood; evidence of archaeological sites, cultural or religious aspects in the properties or in the communities region.

Step 3 was carried out under the research project "Simplified HCV Approach for Smallholders" SHARP/Proforest. The project field-test step in Brazil was held in November/December, 2014 in communities Itabocal and Catita, where workshops were carried out with all palm oil producers of the communities (17 smallholders of Itabocal and 15 od Catita). The workshops covered the HCV identification present in the smallholdings and in the region of communities, HCV threats and management. Presence of endangered, rare and endemic species were identified through smallholders engagement from a previously selected species list and pictures; the presence of environments (secondary vegetation with more than 10 years, vegetation with more than 20 years, floodplain vegetation, wetlands, and grasslands) in the plots; presence of nesting, reproduction and feeding areas, status of riparian forests (permanent preservation areas), use of resources (wood, firewood, water and medicines); presence of cultural and religious aspects and archaeological evidence sites (polished ax blades (known as lightning stones) and fragments of ceramic pots, both of indigenous origin). HCV threats were also identified, as use of fire, hunting, deforestation, logging and firewood. HCV management and maintenance action were consulted, as the reduction of hunting, controlled fire-use, participatory monitoring of species, herbicide use reduction, adjustment of domestic sewage, garbage and solid waste. Annex 15 presents evidence of this consultation.

High Conservation Values - HCV

The assessment of HCV is a cross-cutting issue which involves the study of socio-environmental impacts in addition to the areas described in previous sections HCV 1-4 (e.g. fauna and flora survey, threatened species, endemic, critical temporary use, water resources, areas of erosion control, protected areas, forest fragments and vegetation structure).

Besides the above mentioned attributes, the consultations with local communities were designed to help identify HCV5 and HCV6. HCV 5 concerns the provision of sources and/or key areas to suit the basic needs of local communities. The areas reported by interviewees were

mainly areas for fishing in the River Irituia and Itabocal and the major streams of the communities Jurujaia, Jacundaí, Cunarijó, Santo Domingo, Cunarijó, among others. Other areas for collecting firewood, medicinal plants and nut trees were also reported, but often, they are located next to the farmer's house or forest set aside.

HCV 6 covers the critical areas for traditional cultural identity of local communities (e.g. areas of cultural, ecological, economic or religious significance identified in cooperation with these communities). In addition to these criteria, areas of archaeological importance have recently been incorporate. Regarding the presence of religious or historical sites in the communities, respondents were unaware of the existence of either, but many residents have indicated the existence of archaeological evidence on their properties, especially near the banks of streams, along the roads or in the area of slashes. The archaeological evidence reported includes polished ax blades (known as lightning stones) and fragments of ceramic pots, both of indigenous origin.

In smallholdings, often the plots limits were not established by the competent institutions (National Institute of Colonization and Agrarian Reform, Land Institute of the Pará state). Thus, it was necessary to conduct a participatory mapping. In this sense, ADM technicians responsible for technical assistance to smallholders visited all plots with maps previously made on satellite images, indicating the point's location. Along with the family farmer, the plots limits were mapped using natural boundaries such as roads, rivers, vegetation fragments viewable through satellite image. It is noteworthy that in some cases the plot mapped belongs to more then one person. This situation occurs mainly among families where a single plot is divided between descendants and the definition is not clear by them, or has not been established. Although, there is no use conflict.

Having the limits of all smallholdings, advanced secondary forest fragments (potential HCV 1) were mapped and the riparian forest (permanent preservation areas PPA - HCV 4) according to the Brazilian Forest Code criteria (30 meters for rivers 10 meters wide; 50 meters for rivers from 10 to 50 meters wide; 100 meters for rivers from 50 to 200 meters wide; 200 meters for rivers from 200 to 600 meters wide. the same procedure was performed for the properties of business partnership.

Table 4.4 below presents a summary of the identification procedure, information sources, classification criteria and definition of High Conservation Value Areas.

Table 4.4 – HCV, elements, sources of information, criteria and delimitation

HCV	Elements	Sources of Information	Criteria	Delimitation
HCV 1 - Globally, regionally or nationally significant concentrations of biodiversity values	• Protected Areas	• IBAMA • IBGE, SEMA/PA	• Indigenous Lands	• Mapping of Indigenous Lands
	• Threatened and endangered species • Endemic species	• SEMA/PA, IBAMA, IUCN (threatened species lists) • Primary and secondary field surveys. • Consultations with smallholders	• Forest fragments with the presence or probable presence of threatened species	• Mapeamento de vegetação, extraindo-se fragmentos florestais de vegetação secundária avançada, áreas alagadas, vegetação de igapó e várzea. • Vegetation mapping, extracting forest fragments of late secondary vegetation, foodplain and riparian vegetation.
	• Critical temporal use	• Satellite images. • Field surveys.	• Mapping wetlands and oxbow lakes. • Nesting sites for birds	• Mapping using Satellite images and field surveys.
HCV 2 - Landscape-level ecosystems and mosaics	-	• Vegetation mapping. • Satellite images.	• Not identified	-
HCV 3 - Ecosystems and habitats - rare, threatened, or endangered ecosystems, habitats or refugia.	• Grasslands, campinaranas or plain white sands.	• Satellite images. • Field surveys. • Consultations with smallholders	• Mapping of grasslands, campinaranas or plain white sands.	• Mapping using Satellite images. • Field surveys.

Table 4.4 – HCV, elements, sources of information, criteria and delimitation

HCV	Elements	Sources of Information	Criteria	Delimitation
HCV 4. Ecosystem services	• Critical areas for water catchments • Critical areas to erosion control	• Vegetation mapping. • Water resource mapping. • Local community mapping • Consultations with smallholders	• Identification of areas forested or not, located near groundwater recharge areas or springs, that make up drainage areas or buffers around drainage areas and that are used by local communities.	• Mapping buffer zones around selected drainage areas according to Brazilian Forest Code. Field surveys.
HCV 5. Community needs	• Water, wood, firewood	• SEMA data of Indigenous Lands • Water resources mapping. • Fieldwork. • Consultations with smallholders	• Rivers and streams • Possible fruit trees (bacuri, Brazil nut, piquiá) present in the area • Drainage mapping. • Local community mapping • Mapping of Indigenous Lands	• Identification of rivers and streams important for communities. • Mapping of Indigenous Lands
HCV6. Cultural values	• Archeological sites	• Consultation with local communities and smallholders	• Potential presence of archeological sites or artifacts	• Mapping of Potential presence of archeological sites or artifacts

5. SUMMARY OF ASSESSMENT FINDINGS

5.1 Geomorphology and Soils

The region is located in an area characterised by low slope (<3%), although slopes increase in areas near drainages. However, in other surfaces, the terrain is very flat. In some areas steeper slopes occur, such as portions of the farm Arauai. In such areas, planting was avoided and the same practice was followed for other farms with similar slopes.

The region has relative uniformity in the types of soils, with predominance of Xanthic Ferrasols, presenting subdivisions, when the amount of clay present is analyzed. There are small patches of other types of soils, as Fluvic Neosoils occurring predominantly along the riverbanks, mainly the River Irituia.

The analysis of grain size, fertility and their spatial distribution showed that there are local differences in the patterns of particle size distribution and fertility. This result, although not conclusive and incipient, provides an important baseline of the characteristics of soils that may be used for more detailed studies of fertilization. The soils present, texturally, predominantly medium and coarse grain. In terms of fertility, the soils present very low patterns of fertility over the entire region.

Due to the patterns of sandy soils and slope, the areas of greatest risk of erosion are contiguous to drainages, especially along access and service roads.

The residual analysis of herbicide (glyphosate and AMPA) in soil showed no residues, even in sites of recent application, such as nurseries. This is consistent with the known characteristics of rapid degradability of this compound in soil. However, it also provides a baseline to be monitored by the company throughout the activity.

5.2 Water Resources

The analysis of water quality of surface water bodies showed good quality at all points assessed, within the legal standards; there is no evidence of contamination related to the activity. Analysis of herbicide (glyphosate and AMPA) in water showed no residues.

Like the soil analyses, this result provides an important baseline which should be monitored and maintained throughout the activity.

The rivers and streams of the region are extremely important to the livelihoods of local people, being used for various activities such as drinking, bathing, fishing, transportation, watering livestock, transportation and recreation. Thus, they were classified as HCV and the water quality of the rivers and strems under the influence of plantation activities should be monitored and maintained throughout the activity.

5.3 Land Use and Vegetation Replacement

The assessment of land use between 08/2006 and 06/2013 and the calculations of areas for planting palm oil, the total area of properties, forest set aside (legal reserve), riparian forests (permanent preservation areas) and replacement secondary vegetation are presented in table 5.1. It is notable that the Fazenda Santa Barbara II showed the highest rate of replacement of secondary vegetation.

Table 5.1 - Properties, total area, planting area and replacement of secondary vegetation between 2006-2013.

Farm	City	Total Area (ha)	Planted Area (ha)	Replacement of secondary vegetation (ha)
Farm Santa Bárbara II	Irituia	1.926,78	405,44	112,51
Farm São José	Irituia	194,98	37,32	12,48
Farm Irituia	Irituia	408,52	127,66	55,69
Farm Arauai	Irituia	1.222,1	335,00	0,0
Farm Paraíso do Noi	São Domingos do Capim	1.962,65	523,88	47,65
Farm Rio Claro	Santa Maria do Pará	324,40	151,16	0,0
Farm Alegria I	Capitão Poço	210,65	154,96	0,0
Farm Alegria II	Capitão Poço	739,03	410,69	0,0
Farm Ariramba	Capitão Poço	2.166,02	1948,39	0,0
Fazenda Eldorado I	São Miguel do Guamá	654,68	366,32	0,0
Farm Eldorado II	São Miguel do Guamá	25,44		0,0
Farm Eldorado III	São Miguel do Guamá	51,94		0,0
Farm Quara	São Domingos do Capim	275,05	134,17	34,08
Farm Abaré	Santa Maria do Pará/ São Miguel do Guamá	456,17	145,5	40,42
Farm Abadia	São Miguel do Guamá	717,58	117,27	0,0
Farm Diamantina	São Miguel do Guamá	309,52	172,56	0,0
Farm Águia	São Miguel do Guamá	639,05	293,98	0,0
Farm São Pedro	Santa Maria do Pará	532,65	94,08	0,0
Smallholders	São Domingos do Capim e Irituia	-	1102,30	0,0
Smallholders	São Domingos do Capim, Irituia, Capitão Poço e Mãe do Rio	-	927,20	0,0
Total			**7447,89**	**347,24**

It was possible to detect replacement of secondary vegetation in 7 properties, namely: Abaré, Santa Barbara II, São José, Irituia, Paraíso do Noi e Quara, totaling 347.24 hectares. This replacement is largely in planting areas and legal reserves.

All replacements identified are in areas of secondary vegetation. It has not been identified replacement of primary vegetation (Appendix 17).

Regarding Areas of High Conservation Value, such areas of secondary vegetation that were replaced after Nov 2005 have little potential to be classified as HCV 1 (areas of concentration of rare, threatened, endemic or endangered), since such species were not recorded in the areas for planting on the properties that were assessed. Still, it is not possible to state that these species occurred in viable populations in areas that were replaced in the period 2006-2013, since the condition of vegetation no longer exists. Moreover, it is difficult to establish the status of the vegetation that was replaced (scrubland with 5, 7, 10 years-growth), although it is possible to say that it was of secondary vegetation, acccording the satellite imagery interpretation and regional aspects.

Thus, no areas violate the RSPO criteria 7.3, indicating that there was no substitution of primary vegetation or Areas of High Conservation Value. Appendix 14 presents the maps of land use and vegetation replacement.

Importantly, the Forest Code, Law 12.651, as amended by Law 12.727 of October 2012, and the Economic and Ecological Zoning of the State of Pará, state that rural properties in this part of

Amazon need to have 50% of forest set aside (legal reserve areas). In this case, all properties must have this percentage of Legal Reserve (50%), according to the criteria of the current legislation, or compensation to other areas within the same biome.

Many Permanent Preservation Areas (PPA) are degraded. Such areas must be recovered, through natural recovery, reforestation, among others.

All properties should contain the Rural Environmental Registry approved by environmental department, obtaining the Rural Environmental License and Conduct Adjustment Term, when appropriate.

5.4 Biodiversity and HCV

The project area makes up the so-called **Endemism Center of Belém**. It is estimated that there are only 23% of pristine forests, of which 90% are indigenous lands. Consequently, in this region there is the largest number of species of birds and mammals threatened with extinction in the state of Pará.

The data on biodiversity and biological richness existing in the region are still insufficient and there is a lack of complete compilations.

In a botanical survey conducted in 36 fragments of primary and secondary vegetation in the Endemism Center of Belém, Almeida and Viera (2010) found 340 species of trees, distributed among species of primary and secondary forest. In a survey conducted in the areas of fragments of the properties of business partnership of ADM, 124 tree species and 157 species of the understorey were found.

The avifauna is the best studied group of fauna in the region. Portes *et al.* (2011), after compiling records of birds for the region of Endemism Center of Belém, indicate the occurrence of 529 species. In the present survey 174 species of birds were recorded.

With respect to mammals, in the Brazilian Amazon, Silva *et al.* (2004) estimated 311 species of mammals. Specifically for the Endemism Center of Belém this number is not well known, but is estimated at around 200 species. The present survey reported 35 species, considering only land mammals of medium and large size, and of these 14 species were recorded in the fieldwork.

In 2008, the official list of endangered species in the state of Pará (SEMA-PA 2008) was approved. In this list, 181 species were recognized as endangered, including 53 species of plants, 37 invertebrates, 29 fish, 3 amphibians, 13 reptiles, 31 birds and 15 mammals. In the current study the list of Brazilian fauna threatened with extinction, MMA (2008), was also considered, as was the Red list of IUCN (2013).

In the primary and secondary surveys of this assessment, 38 endangered species were registered or have a reasonable probability of occurrence in the region. Among those that were recorded during fieldwork there were 13 species of plants, 3 birds and 3 mammals.

Noteworthy is the number of endangered species of birds and mammals listed as occurring in the region, making up 54% of threatened bird species and 60% of threatened mammals in the state of Pará, denoting the importance of conservation of the fragments in the region of Endemism Center of Belém. Appendix 16 presents the list of endangered species in the area of the project.

The greatest number of threatened species recorded was found in forest fragments on the farms: Arauaí, Paraíso do Noi and Eldorado; although in all studied fragments at least one endangered or rare species was found. Thus, it is emphasized that the maintenance, restoration and conservation of the fragments that make up the legal reserves and permanent preservation areas of properties in this region is of vital importance in maintaining biodiversity. It is also

possible that other species will be recorded in later studies and that the overall number of endangered species will increase with new surveys.

In consultation with smallholders communities, he/she indicates less significant presence of endangered species in properties forest fragments (1 mammal and 4 birds). Still, the group of fragments present in smallholdings identified as potential HCV 1 have a significant sum of areas, considering deforestation history of this region. The environmental compliance of Legal Reserve and PPA have the potential to increase and maintain the values to these HCVs.

5.5 Vegetation

In the areas for planting the vegetation analyzed was predominantly cattle grazing and shrubland, 5-6 meters high at most. An assessment of areas for planting is presented in Appendix 10.

The region has a recent history of occupation and deforestation. The forest fragments present in the properties, although reduced, show that there is a richness and diversity of flora consistent with other conserved areas in the state, although large species of economic value are no longer present. 13 plant species threatened with extinction in the forest fragments were recorded.

It was observed that the Permanent Preservation Areas were bounded, excluding them from planting. Moreover, areas near drainages with greater slope were also excluded.

It was found that in most of the Permanent Preservation Areas on the farms, the vegetation is in the early stages of succession. However, its delimitation is adequate, and the vegetation development is expected over time.

Some Permanent Preservation Areas, especially in the farms Alegria and Ariramba, present dominance of grasses that will probably hamper the establishment of shrubs and trees. In these areas, and other similar ones, a specific recovery program of Permanent Preservation Areas is recommended, which should assess forest recovery and control invasive grasses.

In the areas of Legal Reserves of the farms a program for protection of reserves of logging and forest resources is suggested.

5.6 Fauna

The region is part of the "Endemism Center of Belém". In the primary and secondary surveys of this assessment, carried out on business partnerships properties, significant biological richness in the forest fragments was identified. 16 species of endangered birds and 9 mammals were recorded. Due the importance of these areas for the conservation of these species, such areas were classified as potential HCV and the protection and restoration of the Legal Reserve and PPA areas of the properties is a priority. Programs of protection of hunting and fishing in Legal Reserves of farms were proposed. Also, programs for monitoring endangered species, aiming to increase the knowledge about the populations of these species present in the fragments, should also be implemented. Appendix 17 presents the list of endangered species.

5.7 Regional Socioeconomic

The region has very low levels of economic and social development, especially in terms of education, sanitation and health.

The positive impacts generated by the production of palm oil could be related to boosting the local economy, labor supply and local businesses.

The main positive direct and indirect impacts related to the activity of palm oil production are:

- Generation of formal direct and indirect jobs and increased income;
- Stimulation of the service sector (agriculture, agricultural machinery and equipment, hospitality, food, trade, occupational medicine, fuel, transport, among others;)
- Stimulation of the informal services economy.

At the same time, the region has great socioeconomic fragility. The economy is based on informal services and the public sector.

There is a tendency of population growth, with migration of the population from rural to urban areas.

It is important to note that in other counties in the state of Pará where the expansion of palm oil production is more intense, there is population growth, especially of low income. The expansion of palm production in the region is still ongoing, and is expected to cause an increase in planting areas in the coming years. A large number of rural workers will therefore be needed for crop activities. With this expansion, the population is likely to increase, when the current and future crops will be in production and the farm labor for harvesting will be demanded.

There are plans to construct a mill for the production of oil palm by ADM, which is also expected to generate direct employment in this agribusiness activity.

The nature of the palm oil activity, which demands large amounts of poorly-paid farm labor, is a challenge to be faced. Public policies and public-private partnerships, in all spheres (municipal, state and federal), could be part of the solution to this problem.

One aspect of the demographics in the municipalities is that there is currently a balance of men and women. It is expected that the ratio will become unbalanced, due to the higher demand for male workers in rural work. This is of concern regarding the increase in violence and prostitution.

An increase in current and expected demand for labor in agricultural activities is occurring and will intensify in the coming years. As such work is considered professional, it is attractive to the local rural population and inhabitants of other poorer regions of Brazil (e.g. Maranhão, Piauí). The pressure for housing in cities and rural settlements nearby causes an increase in the price of real estate, generating values that rural workers often cannot afford, especially those from other regions, which in turn leads to the construction of housing with minimal infrastructure.

Another issue related to the agricultural activity and production of palm oil is taxation. The main municipal taxes (service tax and property tax) are not increased directly by agricultural production, as opposed to manufacturing. In this sense, the generation of a local chain services associated with the production of palm oil is essential for the direct increase in taxes to the municipality and that it is reflected in social policies.

In other municipalities where there has been expansion of palm oil production (e.g. Tomé-Açú and Tailândia), an increase of social problems has occurred, including violence, slums, and drug trafficking, among others.

Although these concerns are ultimately the concern of the government, socially and environmentally responsible agroindustrial producers (in this case ADM) must take into consideration the social problems proceeding from or exacerbated by palm oil production.

As with any agricultural activity, especially in monocultures, the risks associated with climatic factors, pests and diseases is constant. Climatically, the region is in the lower limit of minimal rainfall ideal for the production of palm oil. GM varieties have been developed by Embrapa (Federal Brazilian Company of Agriculture) and other Latin American producers seeking cultivars which are more tolerant of low precipitation.

Regarding pests and diseases, Fatal Yellowing (FY) can be regarded as the biggest threat, because there are no effective control methods. The cause of the disease is still unknown, although there are unconfirmed reports that it is a virus. Large palm oil plantations of the company Dempasa in Santa Isabel do Pará suffered huge losses due to FY in the 1980s, and plantations in the region of Mojú have also been affected by FY.

Although it is not known for certain, FY seems to be associated with rainfall. The occurrence of FY is greater in regions with higher rainfall, in the north of state of Pará. But the mode of transmission is still unknown, and the disease is difficult to control without having unwanted economic impacts.

The expansion of palm oil production in the northeast region of the state increases the risk of disease transmission between plantations of different companies, as the distances between plantations decrease.

Hybrid varieties of oil palm which are more resistant to FY have also been developed by Embrapa, with positive results. However, if it is confirmed that FY is a viral disease, the risk of mutations and the spread of the disease to other genetic varieties is constant.

The bottom line in palm production is the yields. It is known that due the floristic characteristics of the plant, fruit yield is closely related to rainfall. Further, the yield reflects, on average, the rainfall that occurred two years before the year of production. Thus, a year's productivity is influenced by the rainfall of the previous 2 years. Thus, economic sustainability and supply chain sector is closely related to climatic factors and changes. Prolonged periods of drought may be reflected in economic turmoil in the chain of palm oil production.

The monoculture of palm oil may pose a risk to the economic sustainability of companies and therefore the economic chain formed and what tends to increase in the region with the production of palm oil, especially to smallholders.

In order to minimize the negative and maximize the positive effects of the expansion of palm oil production in the region, a variety of plans, programs and projects have been proposed. Noteworthy is the fundamental partnership company with local governments for the implementation of the proposed programs to deal with the socioeconomic impacts. The partnership with research and development in agricultural technology and genetic improvements, especially EMBRAPA, is essential for minimizing the risks of climate change, pests and diseases.

5.8 Smallholders (Family Producers)

The partnership model developed by ADM, which guarantees the purchase of production and provides technical assistance for at least 25 years, is a safety factor for the smallholders. It increases the family income and provides stability. The income increase allows producers to plan and improve the property, in terms of the buildings, catchment and sanitation.

The partnership model supports the land and environmental regularization of the properties. It assists with obtaining farm credit and personal credit, facilitating that it participates in other farm credit to promote family farming.

The partnership model is positive in providing PPE and training in Environment and Work Safety. It helps in the better environmental management of the property, and the security of agricultural work, including in other crops aside from oil palm.

The maintenance of ongoing long-term production tends to reduce the pressure on forested areas which can be created by the desire to establish of new plantations on more fertile soils.

The expansion of palm oil production tends to reduce the production of other local productive chains, carried on by most smallholders. This is what is mainly observed with the chain

of cassava flour and other local food supplies. The smallholders, attracted by the development of palm oil and its market value, migrate to this new productive activity, abandoning the production of flour, beans, corn, fruit and small livestock, thus reducing local supply. A growing lack of these products has been observed. It was observed in this assessment that 56% of producers have decreased their production areas of other products after the implementation of palm oil.

The palm oil production project in partnership with smallholders is carried out with specific funding from the Brazilian federal government for Palm Oil (Palm Eco PRONAF - Program for Strengthening Family Agriculture). This financing program limits the funding to an area of up to 10 ha of palm plantation, in family farms, which have a plot dimension of 25-100 ha on average. This limitation aims to limit the area planted with palm oil, decreasing the income insecurity of a monoculture and ensuring sufficient area for grow other crops, ensuring food security.

Although palm oil has been implemented in an area of up to 10 ha, this has put more pressure on smallholder food security since some of then are unable to cultivate oil palm and other crops simultaneously.

The family farmer is usually limited by the available labor and the area of the property on which he/she can perform agricultural activities. Thus, with an area of 10 ha of palm oil, they usually have difficulty in planting and maintaining other crops.

The partnership model, in which the value of FFB (Fresh Fruit Bunch), associated with the international value of the palm oil, is used to determine payment for production, ties the income of smallholders to variations in the international prices of the product. It also ties their income to the productivity of the area in which they work. This productivity can be associated with uncontrollable factors such as soil fertility, climate, pests, diseases and fire.

Fatal Yellowing (FY) can be considered one of the major risk factors to this production, although the risks of other diseases and fire are also of concern.

The current partnership agreement between ADM and smallholders, states that producers will deliver FFB at certain points in the communities defined by ADM. Many properties are far from the communities, and the costs incurred in transporting the FFB to the points of delivery would be very large and economically impracticable for smallholders, if such transportation is performed individually by each producer. Thus, it is suggested, initially, that ADM makes available delivery points for FFB at a maximum distance of 2 km from each smallholding. This may mean establishing more than one point for each community, changing the contract of partnership related to this item. In addition, it is suggested that ADM perform an economic and logistical study related to the costs of such transportation for smallholders. The training and encouragement to the association by the smallholders is already being implemented in partnership with ADM and SENAR (National Rural Learning Service). The creation of associations could help producers to deliver FFB collectively, which will reduce transportation costs.

The use of herbicides by smallholders should be intensely controlled, mainly through training, proper use of PPE and the proper disposal of containers by the smallholders. The planting of kudzu and manual weeding should be encouraged in order to eliminate the use of herbicides.

The cost of inputs in the production of palm oil by smallholders can be a factor in decreasing income, especially because oil palm requires intensive inputs and the cost of these has been growing over time. It is suggested that ADM perform an economic study, relating the predicted input use and costs, with production forecast, in order to assess how the use of inputs affects production costs. Another recommendation is to conduct an agronomic study to assess nutrient cycling, possibly involving the return of empty bunch to smallholders, in order to reduce the use of inputs. Other strategies involving green manure, training in composting for organic fertilization, among other actions should also be studied for the reduction of input use on smallholders.

It was found that 22% of smallholders are over 50 years old, whereas the production of palm oil takes at least 25 years. It is therefore expected that in some cases the main farmer in the family will not be able to complete a full cycle. Furthermore, it is known that it is common to hire labor in palm oil cultivation, to help in times of increased demand for labor, such as harvesting. This labor is traditionally engaged on a daily basis, without any labor regulation. In the RSPO context, this type of activity is not allowed. Moreover, the cost of this contract may represent expenses that cause family income to drop below acceptable levels. As a result, it is suggested that ADM promote the hiring of labor via producer associations and cooperatives, with legal level of labor regulation. We also suggest an individualized study of producers to assess the ability of families to undertake agricultural activities and the costs of hiring labor.

The main crop carried out by family farmers are planting and production cassava flour, and the crop Acai berry (Açaí). The cassava planting is carried out in the region in a rudimentary system of slash and burning scrublands. This system has shortcomings in terms of reducing long-term soil fertility, and present threats by the use of fire; ranging from the risk of palm oil burning, forest and HCV fires, impacts to air quality and CO_2 emissions. Consultation with family farmers indicated that a way to reduce or eliminate the use of fire in the preparation of cassava plantation area is mechanization. One possibility for the use of mechanization is the acquisition of equipment via association of producers, which imply the strengthening of rural associations.

The acai berry crop is widely held by producers in riparian areas (floodplains and wetlands). Often this crop is done by removing completely the vegetation of these areas which reduces the ecological service of water bodies protection, creating a threat to these HCVs. It is suggested individualized management actions Acai berry in agroforestry systems for ensuring the protection function of the water bodies.

The majority smallholdings have no environmental regulation. The PPA areas and Legal Reserve are not defined and there is a lack of Rural Environmental Registry (RER). It is suggested an environmental regulation action, carrying out participatory Rural Environmental Registry, defining PPA and RL areas and the possible uses and management that is allowed in these areas, besides protection and recovery actions for these areas.

The main risk associated with the production of palm oil by smallholders is to over-allocate efforts to oil palm cultivation, so that their income and food security are closely linked to income from the production of palm oil. Furthermore, the delivery logistics of FFB, the costs of inputs and labor can interfere in the economic activity or make it less profitable than other crops.

5.9 Summary of Social and Environmental Impacts

The selection of significant social and environmental impacts (SEI) was based on an extensive list of potential impacts, on the specialized literature in the field of environmental impacts of agricultural activities, on the primary and secondary data obtained in this assessment, and on the experience of the Orbis Exceller team.

The effects of SEIs were assessed by means of the prognosis of its consequences, in time and space, on the natural environment and on the affected populations.

The SEIs are here presented in a matrix, where they are categorized according to: topic (soil, water, vegetation, fauna, socioeconomic); type of impact; source of impact (land preparation, planting); category (positive or negative); occurrence (direct or indirect); duration (temporary - when the impact is related to a restricted period of activity or permanent - related to the whole activity); and scope (local or regional). Table 5.1, below, shows the matrix of social and environmental impacts.

Table 5.1 - Matrix of social and environmental impacts.

Element	Social and Environmental Impacts	Source of Impacts	Category	Occurrence	Duration	Scope
Soil	Erosion on access roads and service roads, Permanent Preservation Areas (riparian areas) and slope	Land preparation and planting	Negative	Direct	Permanent	Local
	Protection of soil erosion and leaching	Planting	Positive	Direct	Permanent	Local
	Contamination by residues of herbicides and pesticides	Planting	Negative	Indirect	Temporary or Permanent	Local and Regional
	Excessive use of inputs (fertilizer)	Planting	Negative	Indirect	Permanent	Local and Regional
Water Resources	Entrainment of sediment to surface water resources	Land preparation and planting	Negative	Indirect	Temporary or Permanent	Local
	Organic pollution of surface and groundwater resources from facilities infrastructure	Land preparation and planting	Negative	Direct	Temporary or Permanent	Local
	Contamination by herbicide residues in surface and groundwater water resources	Land preparation and planting	Negative	Indirect	Temporary or Permanent	Local
	Decrease of entrainment of sediment to surface water resources with the establishment of plantations	Planting	Positive	Indirect	Permanent	Local
Air	Increased vehicle traffic generating increased sediment suspended in the air (dust) near rural communities	Vehicle traffic	Negative	Indirect	Permanent	Local
Vegetation and Fauna	Increase of biodiversity, maintenance of rare, threatened and endemic species.	Environmental compliance and recovery of Legal Reserves (forest set aside) and Permanent Presevation Areas (riparian forest).	Positive	Indirect	Permanent	Regional

Table 5.1 - Matrix of social and environmental impacts.

Element	Social and Environmental Impacts	Source of Impacts	Category	Occurrence	Duration	Scope
Vegetation and Fauna	Decrease of edge effects in fragments	Planting	Positive	Indirect	Permanent	Local
	Replacement of secondary vegetation in palm oil plantations decreases local biodiversity	Planting	Negative	Direct	Permanent	Regional
	Use of vegetation of Legal Reserve and PPA to produce pole and pickets for planting	Planting	Negative	Direct	Temporary	Local
	Development of palm oil plantations should create environments for the movement of some faunal groups between forest fragments	Planting	Positive	Indirect	Permanent	Regional
	Removal of logs in planted areas that could be used by nesting birds.	Planting	Negative	Direct	Permanent	Local
	Bridges and crossings of service roads leading to the obstruction of downstream water bodies and changes in fish habitat	Land preparation and planting	Negative	Direct	Permanent	Local
Regional Socioeconomic	Creation of employment and income in the agro-industrial activities	Whole period of activity	Positive	Direct	Permanent	Local and Regional
	Boosting the local economy and generating taxes	Whole period of activity	Positive	Direct	Permanent	Regional
	Migration and population growth	Whole period of activity	Positive	Indirect	Permanent	Regional
	Demographic imbalance of men:women ratio.	Whole period of activity	Negative	Indirect	Permanent	Regional
	Local infrastructure improvement	Whole period of activity	Positive	Indirect	Permanent	Local

Table 5.1 - Matrix of social and environmental impacts.

Element	Social and Environmental Impacts	Source of Impacts	Category	Occurrence	Duration	Scope
Regional Socioeconomic	Inadequate housing conditions of migrant rural workers	Whole period of activity	Negative	Direct	Permanent	Local
	Rising prices of rural land	Whole period of activity	Negative	Indirect	Permanent	Regional
	Land Regularization	Whole period of activity	Positive	Indirect	Permanent	Regional
	Increased insecurity due to the generation of a number of rural low-income male workers	Whole period of activity	Negative	Indirect	Permanent	Local
	Possibility of accidents on the farm access roads	Whole period of activity	Negative	Indirect	Permanent	Local
	Increased demand for health services due to population growth	Whole period of activity	Negative	Indirect	Permanent	Local
	Professional training of employees	Whole period of activity	Negative	Indirect	Permanent	Regional
	Inadequate transport of rural workers	Whole period of activity	Negative	Direct	Temporary	Local
	Lack of Field Shelters	Planting	Negative	Direct	Temporary	Local
	Lack of regularity in the days of payment to employees of subcontractors	Planting	Negative	Direct	Temporary	Local
	Lack of unionization of rural workers	Planting	Negative	Direct	Temporary	Local
	Accidents at work	Whole period of activity	Negative	Direct	Permanent	Local
	Contamination of workers in the application of herbicides	Whole period of activity	Negative	Direct	Permanent	Local
	Research and development in the palm oil	Whole period of activity	Positive	Indirect	Permanent	Regional
	Negative effects of possible serious damage of activity caused by diseases and pests in plantations	Whole period of activity	Negative	Direct	Permanent	Regional

Table 5.1 - Matrix of social and environmental impacts.

Element	Social and Environmental Impacts	Source of Impacts	Category	Occurrence	Duration	Scope
Regional Socioeconomic	Negative effects of possible economic damage by climatic factors	Whole period of activity	Negative	Direct	Permanent	Regional
	Potential damage to unidentified archaeological sites on smallholdings and business partnerships	Planting	Negative	Direct	Permanent	Regional
Smallholder (family producers)	Use of fire in the preparation of cassava planting areas	Indirect activities of smallholders	Negative	Indirect	Permanent	Local and Regional
	Organic pollution of surface and groundwater water by sewage	Indirect activities of smallholders	Negative	Indirect	Permanent	Local and Regional
	Hunting, gathering and fishing wild threatened animals with extinction or reduced populations	Indirect activities of smallholders	Negative	Indirect	Permanent	Local and Regional
	Environmental regulation of properties	Indirect activities of smallholders	Positive	Indirect	Permanent	Local and Regional
	Dependence on income generated by the palm oil production.	Whole period of activity	Negative	Direct	Permanent	Local
	Decreased on food production, creating risks to food security	Whole period of activity	Negative	Direct	Permanent	Local and Regional
	Lack of association or associations no strengthened	Whole period of activity	Negative	Direct	Permanent	Local
	Negative effects of possible serious damage of activity caused by diseases, pests and climate in plantations	Whole period of activity	Negative	Direct	Permanent	Local and Regional
	Negative income effects caused by excessive decrease in the price of palm oil	Whole period of activity	Negative	Direct	Permanent	Local
	Local infrastructure improvement	Whole period of activity	Positive	Indirect	Permanent	Local and Regional

Table 5.1 - Matrix of social and environmental impacts.

Element	Social and Environmental Impacts	Source of Impacts	Category	Occurrence	Duration	Scope
	Training of smallholders	Whole period of activity	Positive	Direct	Permanent	Local and Regional
	Accidents or contamination by chemical use	Whole period of activity	Negative	Direct	Permanent	Local
	Technical assistance and research used in other food crops	Whole period of activity	Positive	Direct	Permanent	Local
	FFB delivery points, defined in contract, distant from smallholdings.	Whole period of activity	Negative	Direct	Permanent	Local
Smallholder (family producers)	High cost of inputs, decreasing incomes from production	Whole period of activity	Negative	Direct	Permanent	Local
	Hiring labor without regulation and decreased income from production due to the cost of labor	Whole period of activity	Negative	Direct	Permanent	Local

5.10 Areas of High Conservation Value - HCV

The delineation of HCV boundaries ideally depends on reliable sources of information, but sometimes the only information available is not objective. For the assessment, HCV boundaries were established using the best sources of official information from important, well known institutions in each topic assessed, in addition to primary data obtained during the assessment and consultations to local communities. However, some HCV categories are based on technical interpretation and value judgments, which can also be subjective. Any decisions based on value judgments have been noted as part of the current assessment.

HCV 1 - Globally, regionally or nationally significant concentrations of biodiversity values

Although qualitative and quantitative characteristics for the classification of HCV 1 in the areas assessed have been identified, there are not enough data to indicate the presence of a significant concentration and viable populations of threatened, rares and endemic species found, both in fragments of business partnerships properties and smallholdings,and in this case, areas of remnant vegetation that support such species were classified as potential HCV 1.

Protected Areas

Indigenous Lands in the region were considered in this category. Other categories of protected areas, such as conservation areas, are not found near the assessed area.

Threatened and Endangered Species

It was considered all forest fragments of upper secondary vegetation in the business and smallholders partnership. It was Identified the occurrence of 38 species endangered, rare and endemic in the fragments of the are. Many of these species are birds that require smaller area of living. Furthermore, although individually small fragments could not support viable populations of most species, the sum of the areas of all fragments has potential to ensure the occurrence of some of them and have potential for maintaining or increasing this value. Thus, we chose to define all remaining fragments with potential occurrence of endangered species throughout the properties and as potential HCV 1.

Endemic Species

All areas in which endemic species are found were also found to serve as habitat for endangered species, especially avian species. Therefore areas with endangered or endemic species were grouped together as one category.

Spatial and temporal concentrations of species

Areas of critical temporal use of species are found in the region. Such areas are mainly the wetlands and oxbow lakes associated with the rivers Guamá, Capim and Mãe do Rio. They are used by breeding fish, amphibians and birds feeding.

In addition, dry trees are used by nesting birds, mainly ararajuba (*Guaruba guarouba*). These trees may be distributed throughout the region, in plantation areas, permanent preservation areas, and legal reserves.

HCV 2. Landscape-level ecosystems and mosaics

In the Landscape-level ecosystems and mosaics with 50.000 hectares size no longer occur. Therefore, this HCV was not considered.

HCV 3. Ecosystems and habitats - rare, threatened, or endangered ecosystems, habitats or refugia.

In the region, the environment known as grasslands, *campinaranas* or plain white sand can be classified as HCV 3. Although this environment has not been identified in the areas of the farms or smallholdings assessed, it can be found in the region and this HCV was indicated as potentially occuring in the landscape.

HCV 4. Ecosystem services.

Basic ecosystem services in critical situations including protection of water catchments and control of erosion of vulnerable soils and slopes

In the region, there are rural communities, including comunities of smallholders partners who use rivers and streams for transportation, fishing, water consumption and leisure. The smallholdings are located in these communities and the drainage into smallhondings flow into the major rivers and streams used by communities in the region. Still, according to the consultation to communities, water of rivers and streams is an essential source for such communities, with no other source of this resource locally.

In the South West of the region is the indigenous land known as Upper River Guama. The farms Alegria and Ariramba are located upstream of the drainages that form the River Guamá which drains the Indigenous Land. The other farms also have drainages that supply the major rivers and streams in the region. Therefore, permanent preservation areas (PPA), which in general are associated with a higher slope near the drainages, were classified as HCV 4, due to the importance of water sources and PPA in maintaining the quality and quantity of water supplied to the rivers and streams downstream. The PPA and areas of slope are placed in this category, mostly the ones found on the farm Arauaí.

HCV 5. Community needs. Sites and resources fundamental for satisfying the basic necessities of local communities or indigenous peoples.

Regionally, these areas are associated with the occurrence of fruit species appreciated by the local peoples (Brazil nut, *bacuri, piquiá and tucumã*). The Brazil nut tree is a protected species in the state of Pará.

It is recognized that rivers and streams in the Amazon region are important for local people, in terms of fishing, transportation, facilities, consumption and leisure. Therefore, all major rivers and streams are classified in this category, and the PPAs that have the function of quality and quantity of water protection as HCV 4.

This HCV is also assigned to areas for hunting, which are vital to meet the food needs of populations. The rural communities in the region are largely based on agriculture, and hunting is not used to satisfy basic needs. It is possible that the HCV occurs within the indigenous land of the Upper Rio Guamá, however, as this area was not assessed, this HCV is classified as potential in this indigenous land. Furthermore, this area is already classified as a potential HCV 1.

The communities of smallholders indicated the use of wood as a key source used in furnaces for the production of flour. This wood is obtained from the burning of scrubland areas, generally those used for cassava crop. As agriculture activity has not been considered as HCV by expert guidelines, this source was not considered as HCV 5.

HCV 6. Cultural values - Sites, resources, habitats and landscapes of global or national cultural, archaeological or historical significance, and/or of critical cultural, ecological, economic or religious/sacred importance.

No critical areas were identified in this category. This HCV could be defined as areas of religious importance, burial sites or traditional festivals; however local populations have not reported such sites in the area.

It is possible that this HCV occurs within Indigenous Land. However, this is not located in the direct influence of the activity.

Archeological sites are also included in this HCV, given their historical and cultural value. Although there are reports from comunities and smallholders consultation, and some physical evidence of archeological sites, they were not confirmed during the consultations. These areas were therefore classified as a potential HCV.

Figure 5.1 shows a map of Areas of High Conservation Value (HCV) in the landscape. The Appendix 18 and 19 show the HCV areas, mapped in detailed scale, for properties of business partnership and smallholdings.

Table 5.3 below shows the sources of information and criteria used for defining the HCVs.

Tables 5.4 and 5.5 indicate the area in hectares of HCV categories present and potential present in the properties of business partnership and smallholdings.

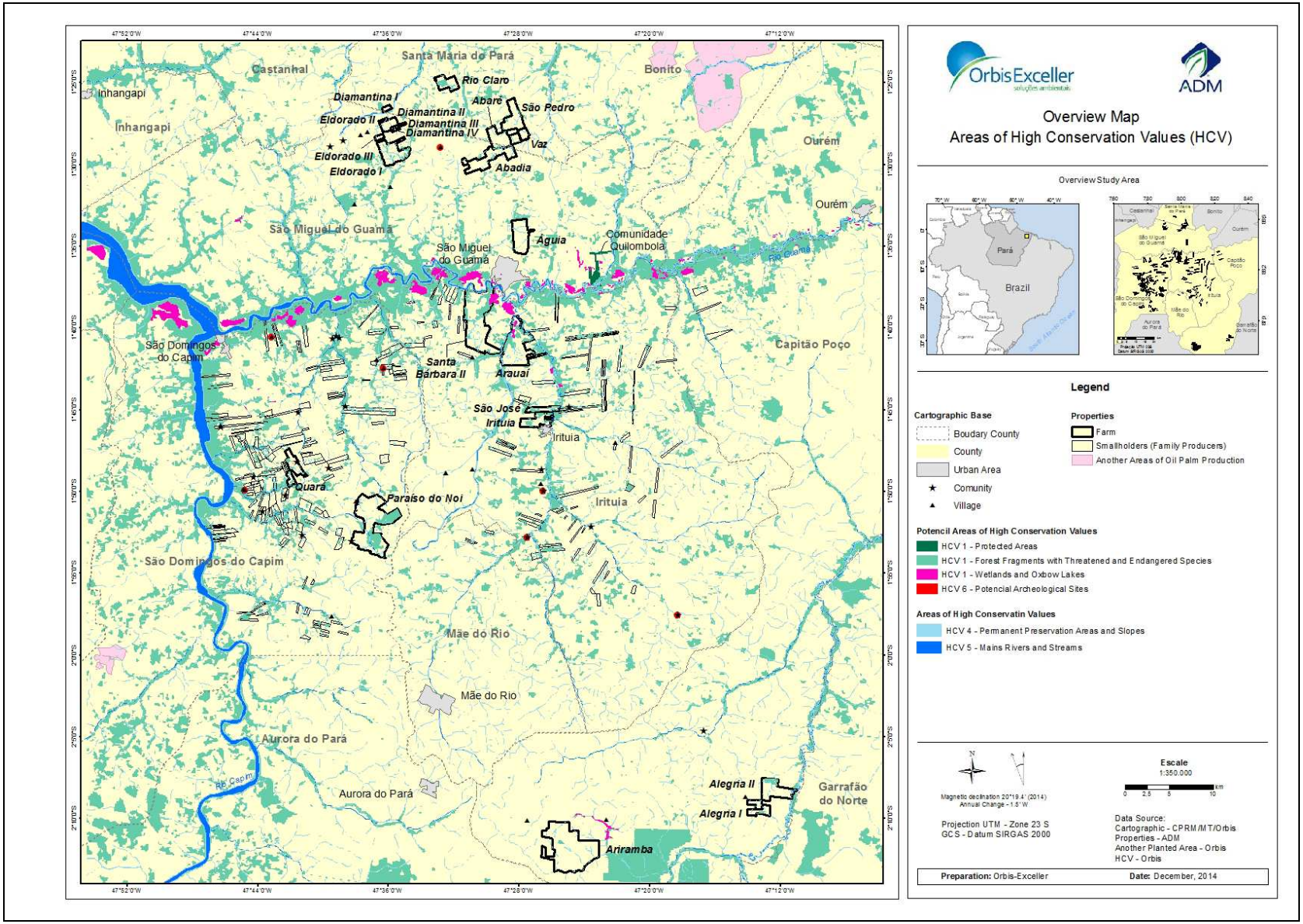


Figure 5.1 - Map of High Conservation Values (HCV).

Table 5.3, below, shows indication of presence, potential presence or absence of HCV in the properties and landscape.

Table 5.3 - presence, potential presence or absence of HCVs.

HCV	Description	Location	Presence	Potential Presence	Absence
HCV 1	Protected Areas	Landscape			
	Concentration of rare, threatened and endangered species	Landscape/ farms			
	Concentration of endemic species	Landscape/ farms			
	Critical temporal use	Landscape			
HCV 2	Landscape-level ecosystems and mosaics	-			
HCV 3	Ecosystems and habitats - rare, threatened, or endangered ecosystems, habitats or refugia.	Landscape			
HCV 4	Critical areas for water catchments .	Landscape/ farms			
	Critical areas for erosion control	Landscape/ farms			
	Areas that act as barriers to destructive fire	-			
HCV 5	Sites and resources fundamental for satisfying the basic necessities of local communities or indigenous peoples (fruit species, major rivers and streams)	Landscape			
HCV 5	Sites and resources fundamental for satisfying the basic necessities of local communities or indigenous peoples (hunting areas and indigenous land)				
HCV 6	Cultural values – archaeological sites	Landscape			
Legend			**Presence**	**Potential Presence**	**Absence**

Table 5.4, below, shows the Areas of High Conservation Values for present or potential presence in business partnerships properties.

Tabela 5.4 - Areas of High Conservation Values for present or potential presence in business partnerships properties

Farm	HCV	Description	Area (ha)
Abadia	4	Riparian vegetation areas and steep slopes alongside water bodies	50,08
	1	Fragments with potential presence of endangered, rare or endemic species	25,53
Abaré	4	Riparian vegetation areas and steep slopes alongside water bodies	27,90
	1	Fragments with potential presence of endangered, rare or endemic species	15,46
Águia	4	Riparian vegetation areas and steep slopes alongside water bodies	34,29
Alegria I	1	Fragments with potential presence of endangered, rare or endemic species	19,59
	4	Riparian vegetation areas and steep slopes alongside water bodies	13,70
Alegria II	1	Fragments with potential presence of endangered, rare or endemic species	82,87
	4	Riparian vegetation areas and steep slopes alongside water bodies	57,45
Arauaí	1	Flood plain vegetation and wetlands	45,18
	4	Riparian vegetation areas and steep slopes alongside water bodies	133,45
	1	Fragments with potential presence of endangered, rare or endemic species	270,07
Ariramba	1	Fragments with potential presence of endangered, rare or endemic species	24,22
	4	Riparian vegetation areas and steep slopes alongside water bodies	88,58
Diamantina II	4	Riparian vegetation areas and steep slopes alongside water bodies	15,52
Diamantina IV	4	Riparian vegetation areas and steep slopes alongside water bodies	1,62
Eldorado I	4	Riparian vegetation areas and steep slopes alongside water bodies	71,37
Eldorado I	1	Fragments with potential presence of endangered, rare or endemic species	72,95
Eldorado II	4	Riparian vegetation areas and steep slopes alongside water bodies	2,23
Eldorado III	4	Riparian vegetation areas and steep slopes alongside water bodies	2,49
Itituia	4	Riparian vegetation areas and steep slopes alongside water bodies	1,86
	1	Fragments with potential presence of endangered, rare or endemic species	123,00
Paraíso do Noi	1	Fragments with potential presence of endangered, rare or endemic species	486,17
	4	Riparian vegetation areas and steep slopes alongside water	142,23

Tabela 5.4 - Areas of High Conservation Values for present or potential presence in business partnerships properties

Farm	HCV	Description	Area (ha)
		bodies	
Quara	1	Fragments with potential presence of endangered, rare or endemic species	51,70
	4	Riparian vegetation areas and steep slopes alongside water bodies	24,76
Rio Claro	4	Riparian vegetation areas and steep slopes alongside water bodies	17,78
	1	Fragments with potential presence of endangered, rare or endemic species	79,52
Santa Barbara II	1	Flood plain vegetation and wetlands	34,38
	4	Riparian vegetation areas and steep slopes alongside water bodies	178,56
	1	Fragments with potential presence of endangered, rare or endemic species	456,37
São José	4	Riparian vegetation areas and steep slopes alongside water bodies	9,64
	1	Fragments with potential presence of endangered, rare or endemic species	66,14
São Pedro	4	Riparian vegetation areas and steep slopes alongside water bodies	27,46
	1	Fragments with potential presence of endangered, rare or endemic species	15,30
Vaz	4	Riparian vegetation areas and steep slopes alongside water bodies	21,60
Total HCV 1			**1868,46**
Total HCV 4			**900,98**
Total			**2769,45**

Table 5.5, below, shows the Areas of High Conservation value for HCV present or potential presence in smallholdings.

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
Ajará	Adnor Teodoro Martins	4	0,88
		1	8,62
Ajará	Edson Ferreira de Moura	1	3,08
Ajaraizinho	Edemundo Pereira Peniche	1	18,74
		4	2,01
Araraquara	Edival Batista da Silva	1	30,71
		4	3,45
Baixo Palheta	Antônio Maria Conceição da Silva e Domingos de Jesus Almeida Neves	4	6,51
	Benedito Maciel Cardoso	1	1,84

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
		4	1,26
	Bernardina Ferreira	1	13,55
		4	2,78
	Edilson Gomes Soares	1	10,34
		4	8,00
	Joao Oliveira Lopes Filho	1	16,38
		4	12,19
	João Pontes das Neves	1	3,58
		4	2,16
	Jovelino Ferreira de Oliveira	1	5,15
		4	6,60
	Lazaro Braga Rodrigues e Darley Rodrigues	1	1,28
		4	9,19
	Levinda Santiago das Neves	1	5,34
		4	3,12
	Luiz Carlos Neves dos Santos	4	4,13
	Luiza da Conceição Neves	1	1,46
		4	1,66
	Manoel de Jesus dos Santos	1	0,87
		4	1,31
	Manoel Neves e Pedro Ferreira das Neves	1	17,32
		4	13,29
	Raimundo das Neves	4	6,55
		1	34,52
Bangu	Orlandino de Jesus Pinheiro	4	2,39
	Regivaldo Maria Lima de Oliveira	1	2,55
		4	2,30
Belazinha	Antônio Carlos da Cruz Fernandes	1	10,11
	Bernardo Santos Queiroz	1	5,12
		4	2,18
	Clemente Furtado Queiroz	1	1,40
		4	1,30
	Domingos Laelson Rodrigues Caetano	1	9,76
	Elias Lopes David	1	3,99
	Francisco Valdeci Gomes da Silva	1	14,34
		4	1,67
	Jonas Leal Pontes	1	3,91
		4	6,08
	José Pereira da Silva	1	6,56
		4	1,17
Boa Viagem	Edilson Dias Lopes	4	9,79
	Eduardo Ferreira Barros	4	1,25

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
	Geovane Barbosa de Moura	1	0,97
		4	7,95
Bom Jardim	Marcelo Silva Gama	1	9,11
		4	0,14
	Mario Cesar da Silva	4	0,84
Bom Jardim de Irituia	Joelto Oliveira da Silva e Martimiano Oliveira da Silva	1	23,18
		4	11,91
	Manoel Raimundo da Silva Peniche	4	2,80
Bom Jardim Jarí	Deugenio Jose Pantoja dos Santos	4	1,13
		1	5,03
	Ivani Pantoja do Espírito Santo	1	11,15
		4	0,25
Bom Jardim km 21	Aderson da Silva Pantoja	1	20,46
		4	11,51
	Geminiano Tomé da Silva	1	6,00
		4	2,73
Bom Jardim km 22	Antônio Soares de Oliveira	1	0,71
Bom Jesus	Raimunda do Socorro Conceição de Campos	4	1,03
	Walter de Jesus Cordeiro	1	67,96
		4	2,61
Botafogo	José Carlos Passos de Souza	1	28,50
		4	3,33
	Manoel Monteiro de Souza	1	23,18
		4	1,66
	Manoel Rosário dos Santos	1	1,30
		4	0,10
	Rafael Barbosa Fortado	1	9,13
		4	1,20
Brasileira	Maria da Conceição Chaves Mendes de Pina	1	22,14
		4	13,27
Castanhalzinho	Leomar Pinto de Oliveira	4	1,21
Catita	Francisco Oliveira Lopes	1	3,99
		4	3,24
	Gabriel Almeida Lopes	1	1,59
		4	2,68
	Gabriel Rodrigues Lopes	1	0,49
		4	0,09
	João Batista Rodrigues Lopes e José Carlos Rodrigues Lopes	1	0,62
	José Nazareno de Almeida Lopes	1	8,36
		4	4,82
	José Porfirio Lopes de Brito	1	1,87

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
		6	0,79
	José Roberto Conceição da Silva	4	1,79
		1	3,11
	Nilson de Oliveira Brito	1	1,15
		4	1,80
	Nilzon José de Oliveira Brito	1	5,45
	Raimundo Conceição Lopes de Brito	4	4,12
		1	3,02
	Raimundo Oliviera Lopes Filho	4	3,27
	Sebastião da Silva Lopes	4	19,65
		1	43,60
Catuense	Maria Sandra de Oliveira Lima	1	21,08
		4	8,07
Cristo Rei	Adamor do Socorro dos Santos Araujo	4	2,41
	Natalino Ribeiro dos Santos	4	0,09
		4	6,00
Fé em Deus	Elvira Lopes da Silva	4	3,53
	Humberto Raimundo	1	1,05
		4	3,35
	Raimunda do Socorro da Silva Rocha	4	0,73
Floresta	Carlos Alberto Gomes dos Santos	4	0,01
		4	3,04
Galiléia	Arlene Rodrigues Gomes	4	4,73
	Candido Mendes Filho	4	2,83
	Grigório Peniche	1	26,62
		4	2,94
	Ozenias Batista de Oliveira	4	0,06
		4	2,35
	Pedro da Silva Peniche	4	2,99
		1	7,93
Glória	Antônio Lopes dos Santos Neves	4	3,97
	Manoel da Conceição de Araújo	4	7,44
	Vitor de Oliveira Gomes	4	1,01
Itabocal	Candido Oliveira Soares	4	2,55
		1	2,01
	Clemente do Socorro Soares de Almeida	1	13,61
		4	0,83
	Deuzarina Ribeiro Lameira e Monico Oliveira Soares	1	12,65
		4	13,68
	Flademir de Jesus Viana Soares e Domingos de Oliveira Soares	4	4,29

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
		1	48,47
	João dos Santos	4	3,26
		1	13,26
	Jose Alberto Ferreira de Paula	1	12,80
		4	2,29
	José Nunes de Sousa	1	1,89
		4	0,91
	Manoel Soares de Almeida	1	10,57
	Marcos Batista Soares	4	2,01
		1	3,90
	Merilene do Socorro dos Santos Viana e Paulo Sérgio dos Santos Viana	1	9,86
	Oneide das Neves Oliveira	1	4,52
		4	4,33
	Pedro Edilson da Cruz Soares	1	4,34
		4	5,00
	Pedro Paulo Soares de Oliveira	4	3,79
		1	4,60
	Romulo Antônio Nascimento Santos	1	14,68
		4	0,11
	Valdilei Soares Almeida	1	16,81
		4	0,39
Itabocal, Floresta	Izael Teixeira Chumber	1	5,71
Km 14	Jones de Castro Soares e Jonilson de Castro Soares	1	6,93
		4	3,72
Lago	Miguel Angelo Cunha de Oliviera	1	10,62
		4	2,52
Maneta	Braulio de Jesus Nunes	1	2,05
	Jaco Silva	1	13,67
	Maria Piedade Fortado Madalena	1	1,27
Manteiga	Antonio Rosivaldo Barbosa de Souza e Maria Luciene Trindade de Souza	4	5,29
		1	17,91
Monte de Ouro	Candida Ferreira Almeida	4	2,93
		1	13,53
	Diego Ferreira Garcia	1	25,29
		4	4,88
	João da Cruz Maciel Silva	4	5,38
		1	50,84
Monte Sião	Israel Ferreira Garcia	1	14,57

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
		4	0,83
Monte Sião do Jaboticabá	Raimundo Lopes da Silva	1	4,48
		4	3,00
	Valdeir Lopes da Silva	1	2,13
	Zildo Lopes Sodré	1	0,74
		4	0,04
Monte Sião do Rio Capim	Raimundo Araujo Batista	1	32,52
Monte Sinai	Dalto Monteiro Pastana	1	12,34
		4	6,54
	David do Nascimento Monteiro	4	4,81
	Luzenal Ribeiro dos Santos	4	2,19
	Rosilda dos Santos Yoshimoto	1	11,79
		4	11,05
	Teofilo Pastana Monteiro	4	9,07
		1	8,64
Nazaré	Maria de Oliveira Peniche	1	38,35
		4	6,14
Nossa Senhora do Perpétuo Socorro	Luis Trindade Chaves da Fonseca	4	0,96
	Manoel Lopes da Fonseca	1	34,18
		4	0,25
Nossa Senhora do Perpétuo Socorro - BR010 KM 30	José Hivan Chaves da Paixão	1	5,88
		4	1,20
Nossa Senhora Perpétuo Socorro	Antonio Raimundo de Jesus	1	2,59
	Antônio Lopes e Onivaldo Ferreira Lopes	1	12,96
		4	1,14
	Antônio Raimundo Chaves de Jesus	4	1,44
Nova Alinaça	Darley Pereira Oliveira e Osvaldo de Jesus Bezerra Soares	4	2,19
		1	9,93
	Francisco Rosa de Oliveira	1	0,98
		4	0,43
	Jeronimo Alexandre de Oliveira	1	0,45
		1	11,53
		4	5,21
	José Alexandre de Oliveira	1	0,26
	José Maria Lopes da Silva	4	0,88
		1	1,64
	Severino Alexandre de Oliviera	1	2,41
		4	0,01
	Gilson do Socorro Conceição da Silva	4	2,45
		1	19,96
Nova Betel	Antonio Silva Furtado	1	3,10
		4	2,15

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
	Israel Maciel da Cruz	1	4,30
		4	2,35
	João da Costa Prestes	4	2,73
		1	2,61
	Joniel dos Santos Silva	1	5,95
		4	3,65
	Leonilton Dias da Cruz	4	9,22
		1	16,83
	Lucas da Silva Lopes	1	3,71
		4	1,53
	Maria Raulina da Cruz Silva	4	5,44
		1	22,17
	Misael Santos Cunha	1	6,40
		4	2,54
	Moisés Maciel Ferreira	1	6,84
Nova Esperança Betil	Cleide dos Santos Pantoja	1	1,08
		4	5,82
	Irandes João Ferreira Furtado	4	2,12
	José Dorvalino Davi Pantoja	1	1,54
		4	1,89
	José Valdir David Pantoja	4	0,03
		4	0,29
Nova Esperança do Capim	José Maria da Silva Nascimento	1	17,78
		4	0,20
Pacui-Mirim	Jose Roberto da Silva Reis	1	20,71
		4	5,15
	Sebastião Ribeiro dos Santos	1	4,34
		4	3,23
	Mario Oliveira da Silva	1	15,56
		4	3,23
Penha	Doraci Vitorio do Carmo	1	11,87
		4	5,87
Pinheiro	Mário de Oliveira Moreira	1	20,05
		4	0,80
Piquiá	Luiz da Silveira Rodrigues e Manoel Furtado Rodrigues	1	1,23
		4	5,80
	Nazildo Rodrigues de Andrade	4	0,38
		1	12,48
Porta Formosa	Alvaro da Silva Peniche	1	12,37
		4	1,52
Prata	Raimundo Nonato Carvalho da Silva e Antonio Felix Carvalho da Silva	1	22,25

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
		4	1,08
Puraquequara	Antonio Batista da Costa	1	39,68
		4	6,63
	Varlindo Batista da Costa e Vivaldo Travassos Cardoso	4	2,43
		1	26,08
Rancho Fundo	Antonio Marcos Ramos de Oliveira, Francisco Lopes de Freitas e Raimundo Erlinton Oliveira de Freitas	4	3,03
	Arivaldo Jaques Teixeira e José Roberto Furtado dos Santos	1	4,68
	Braz dos Reis	1	2,54
		4	1,34
	Edivaldo Gusmão da Silva	1	17,71
		4	7,45
	Elineusa Lima do Nascimento	1	1,64
		4	1,50
	Ezequias José Tomé do Nascimento	1	3,06
		4	1,37
	João Paulo dos Reis	1	6,09
		4	3,17
	José Carlos Ribeiro	1	7,02
		4	4,51
	José Garcia dos Santos Ferreira	1	0,43
	Maria Cleia de Souza Silva	1	6,11
		4	4,93
	Maria de Jesus Gomes de Lima	1	0,25
		1	19,01
	Maria Lucia Pantoja da Silva	1	3,15
	Maria Silvaneirde Moreira de Veras	4	2,29
		1	13,03
	Raimundo Gomes Travassos	1	6,76
		4	0,15
	Reginaldo Mota de Oliveira	1	12,16
Rosário	Valdelirio Ferreira da Silva e Valdenilson Santos da Silva	4	0,99
Santa Helena (Nazaré)	Eladio de Oliveira	4	4,57
Santa Júlia	Naife Teodoro de Leão	1	33,49
		4	4,84
Santa Luzia da Estradinha	Francisco Marco Lima de Souza e José Nogueira de Souza	1	2,20
		4	5,05
	Jaci Maria Paixão Soares	4	1,25
	Rafael Costa de Almeida	1	2,06
		4	2,73

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
Santa Maria	Carlos Venancio Pereira	1	1,21
		4	8,28
Santa Maria do Curuçá	Juanir Peniche Batista	1	7,96
		4	6,96
Santa Maria do Curuçá (Santana)	Manoel Lopes da Paz	1	11,28
		4	6,11
Santa Maria do Real	Joiscilene de Castro Chumber	1	7,13
		4	0,54
	Jony Soares de Lima	1	33,23
		4	6,70
Santa Rosa	Benedito Reis Costa	1	2,94
		4	3,06
	Raimundo da Silva Peniche	1	0,15
		4	0,42
Santa Terezinha	Geraldo Cordeiro da Fonseca	4	2,03
	José Vanderlei Barbosa Cardoso	4	8,58
		1	12,86
	Maria de Lourdes Batista Vieira	4	1,87
Santo Antônio	Hermenegildo Oliveira da Silva	1	4,63
		4	1,98
	João Soares da Gama	1	15,48
		4	0,47
	Luiz Cordeiro Furtado	1	1,85
		4	0,85
Santo Antônio do Arauaí	Raimundo Soares de Pinho	4	0,25
		1	8,29
São Benedito	Raimundo Edno de Oliveira Reis	1	7,99
		4	5,92
São Benedito do Jaboticacá	Pedro Guilherme Filho	1	35,58
		4	33,35
	Valdomira Guilherme Rosa	1	50,66
		4	34,7
São Brás do Sempre Vivo	Ruth de Jesus Cordeiro e Otacileno Fonseca	1	29,41
		4	2,03
São Francisco	Eliete de Oliveira Nunes	1	1,47
		4	1,59
São João do Candeia	José Ferreira dos Santos	1	5,74
		4	0,43
São João do Candeua	Antonio Maria de Moura	1	8,84
		4	1,39
São João do Sauá	Angelico Rodrigues Lopes	1	11,26
	José do Carmo Furtado Cunha	1	10,59

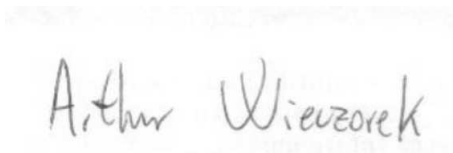
Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
	Manoel Domingos Furtado dos Santos	1	4,72
		4	1,18
	Manoel Furtado dos Santos	1	2,00
		4	1,14
São João do Timboteua	Aoreliano Nunes de Lima	1	1,68
	Raimundo Oliveira Nunes	4	3,48
		1	36,86
		1	5,81
		4	0,06
São João km 18	Zelino dos Reis Araújo	4	3,67
São João km 18		1	17,57
São Joaquim km 13	Fabio da Silva Santos	4	6,52
São Joaquim km 13	Teotonio Lopes de Oliveira	1	11,29
São Joaquim km 13		4	2,51
São Pedro da Boa Vista	Messias da Luz Moreira	4	2,69
São Pedro da Boa Vista		1	9,00
São Pedro Damião	Luis Barbosa Lopes	4	3,75
São Pedro do Cunarijó	Antonio dos Santos da Silva Oliveira e Antonio Fernando da Silva	1	5,75
	Raimundo Nonato Pereira da Silva	1	28,43
	Antônio dos Santos da Silva Oliveira e Antônio Fernando da Silva	4	2,38
	Bianor Silva do Rosário	4	3,82
		6	0,79
		1	3,84
	Custódio Nunes dos Santos Filho e José Maria Nunes dos Santos	4	4,37
		1	10,95
	Edino Pontes da Silva	4	2,51
	Hugo Pontes dos Santos	1	2,94
		4	4,28
	Pedro da Silva Peniche	4	1,06
	Raimundo Nonato Pereira da Silva	4	7,59
São Sebastião km18	Andraci Tomé da Silva	1	1,24
São Sebastião km18	João de Jesus da Silva Pantoja	4	3,48
Sororocá	Valdeci Ribeiro da Conceição	1	4,86
Tessalônia	Jailson Pedreira dos Santos	4	5,66
Timboteua	João Felix Chumber de Lima	4	1,57
Vila Canaã	Cirian Nunes de Oliveira e Fernanda Oliveira de Lima	4	2,22
Vila Conceição	Antonio Marcos Tenório Resende	1	5,75
		4	1,21

Table 5.5 Areas of High Conservation value for HCV present or potential presence in smallholdings.

Community	Smallholder	HCV	Area (ha)
	José Maria Borges Junior	1	6,63
		4	1,16
		1	4,37
Vila Piquia	Clovis da Silveira Pinto Gonçalvez	1	10,65
		4	13,34
Vila Rosário	Antônio Furtado de Andrade	1	18,61
		4	6,78
	Manoel Raimundo Oliveira Ramos	4	1,63
Vila Conceição	Antonio Marcos Tenorio Resende	1	11,24
Total HCV 1			**2032, 48**
Total HCV 4			**740,04**
Total			**2772,58**

6. INTERNAL RESPONSIBILITY

Signing off by HCV & SIA Assessors	Acknowledgement of internal responsibility by ADM Brazil
	I understood and being the guardian of the company, I agree with the contents of this report. 
Arthur Wieczorek **Orbis Exceller Soluções Ambientais**	**Diego Di Martino** **ADM do Brasil**

7. BIBLIOGRAPHY

Aleixo, A., Poletto, F. Portes, C. E. B., Silva, M. S. & Lima, M. F. C. 2008. Review the state of knowledge of Avifauna in the BR-163 Region in the State of Pará. In: Ferreira, L. V. (Org.). Ecological-Economic Zoning of the area of Influence of the BR-163 (Lower Amazon, Xingu and Trans) with emphasis on biodiversity. Belém: v. 2, p. 73-81.

Brasil. INPE (National Institute for Space Research). Landsat ImagesTM+5 2006, 2007, 2008, 2009, 2011 e 2012. Image DMC 2011. Available at: www.dgi.inpe.br/prodesdigital/prodes.php.

Brockelman, W.Y. & Ali, R. 1987. Methods of surveying and sampling forest primate populations. In: C.W. Marsh & R.A. Mittermeier (Org.). Primate Conservation in the Tropical Forest. . Alan R. Liss. New York. Pp. 23-62.

Brown, E., N. Dudley, A. Lindhe, D.R. Muhtaman, C. Stewart, and T. Synnott (eds.). 2013 (October). Common guidance for the identification of High Conservation Values. HCV Resource Network.

CBRO – Brazilian Ornithological Records Committee. 2011. . Available at: <http://www.cbro.org.br>. Acesso: 16/04/2013.

CowelL, 2009. EstimateS: Statistical estimation of species richness and shared species from samples. Version 9.0. User's Guide and application. www.viceroy.eeb.uconn.edu/estimates. (acesso em 16 Abr 2013).

Cullen, L. & Rudran, R. 2006. Linear transects in the density estimative of mammals and birds of medium and large. In: Laury Cullen Jr, Rudy Rudran e CláudioValladares-Padua (orgs.). Study Methods in Conservation Biology & Wildlife Management. 2ª Ed. Publisher Federal University of Paraná, Curitiba. Pp. 169-179.

Department of the Environment of the State of Pará. SEMA PA. 2008. List of species of flora and fauna endangered in the State of Pará http://www.sema.pa.gov.br/interna.php?idconteudocoluna=2283.

Embrapa. 2010. Brazilian Agricultural Research Corporation. Agro-Ecological Zoning for Palm in Deforested Areas of the Amazon - ZAE-Palm.

Government of the State of Pará. 2007. Ecological Economic Macrozoning of the State of Pará. Executive Secretariat for Science, Technology and Environment.

IBAMA 2008. List of species of Brazilian fauna threatened with extinction in the states of Pará and Other Biome. http://www.ibama.gov.br/documentos/.

IBGE. Brazilian Institute of Geography and Statistics. Chart from Brazil to the Millionth. Folhas SA23 e SA22. Available at: www.ibge.gov.br.

IUCN 2013. IUCN Red List of Threatened Species. http://www.iucnredlist.org/about/summary-statistics.

MMA. Ministry of Environment. Database of Amazon in 1:100,000. available at: www.mma.gov.br.

MT. Ministry of Transport. Database Access Roads. available at: www.transportes.gov.br.

Portes, C. E. B.; Carneiro, L. S. ; Schunck, F.; SILVA, M.S.S.; Zimmer, K.J.; Whittaker, A.; POLETTO, F.; SILVEIRA, L. & ALEIXO, A. 2011. Annotated checklist of birds recorded between 1998 and 2009 at nine areas in the Belém area of endemism, with notes on some range extensions and conservation status of endangered species. Brazilian Journal of Ornithology, 19(2): 167-184.

Ridgely, R. S. & Tudor, G. 1994.The birds of South America.The suboscine passerines. Oxoford University Press.

Riordan, P. 1998. Unsupervised recognition of individual tigers and snow leopards from their footprints.Animal Conservation, 1: 253-262.

Department of the Environment of the State of Pará.. SEMA PA. Geographical Data Base. 2011. available at: www.sema.pa.gov.br.

Sigrist, T. 2008. Field Guide - Birds of the Brazilian Amazon. Avis Brasilis Editora. Vinhedo, São Paulo. 471p.

Silva, M.N.F.; Rylands, A.B. & Patton, J.L. 2004. Biogegraphy and Conservation of Mammals in the Brazilian Amazon Forest.Collaborators: Carlos A. Peres, Leonora Pires Costa, Marc van Roosmalen, Pedro M. R. S. Santos, Suley A. Marques-Aguiar, Robert Vossand Yuri Leite. In Biodiversity in the Brazilian Amazon – Assessment and Priority Actions for Conservation, Sustainable Use and Benefit Sharing.Adalberto Veríssimo, Adriana Moreira, Donald Sawyer, Iza dos Santos, Luiz Paulo Pinto, editors. Tony Gross, associate editor. João Paulo Ribeiro Capobianco, general coordination. Instituto Socioambiental and Estação Liberdade, Co-publishers. São Paulo. Pp.: 109-130.

Souza, D. 2002. All Birds of Brazil - Field Guide to Identification. Editora Dall. Rio de Janeiro. 356p.

The Nature Conservancy. 2003. Natureza em Foco: Avaliação Ecológica Rápida. Arlington, Virginia, USA. 175p.

Wemmer, C.; Kunz, T.H.; Lundie-Jenkins, G. & McShea, W.J. 1996. Chapter 9. Mammalian Sign. In Measuring and Monitoring Biological Diversity- Standard Methods for Mammals. Don E. Wilson, F. Russel Cole, James D. Nichols, RasanayagamRudran and Mercedes S. Foster, editors. Smithsonian Institution Press, Washington and London. Pp.: 157-176.