MALI JATROPHA CURCAS PLANTATION PROJECT

Document Prepared By Eco-Carbone

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1 PROJECT DETAILS

1.1 Summary Description of the Project

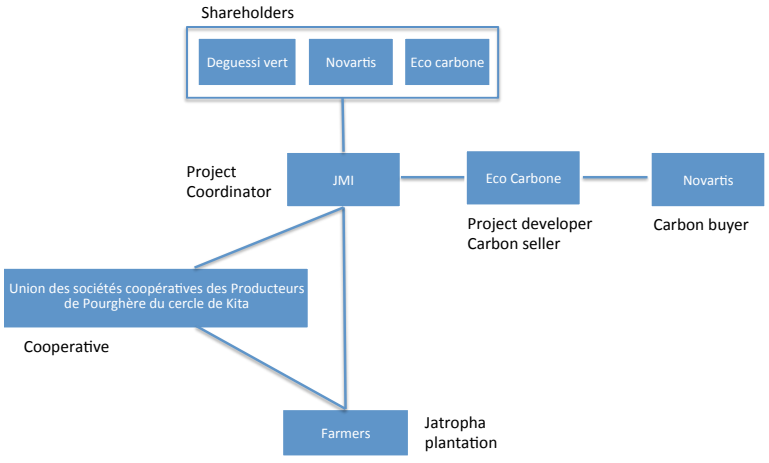
1.1.1 Overview

The Mali *Jatropha curcas* Plantation Project (MJCPP) aims to empower rural communities to adopt sustainable agro-forestry practices through *Jatropha curcas* plantations. The Malian Government has expressed its strong support to this project, as Jatropha has become one of the main priorities of the country[1].

The MJCPP is based on a strong partnership involving the following parties:

- Rural communities represented by the *Union des producteurs de Pourghère*[2] *de Kita*.
- DéguessiVert, a dynamic Malian agro-business.
- Novartis, a major international pharmaceutical company.
- Eco-Carbone, a French investor that develops Jatropha and carbon projects
-

Novartis, DéguessiVert and Eco-Carbone have established Jatropha Mali Initiatives (JMI) a joint venture company to manage the project activities. One of the reason Novartis has entered the project was to buy the carbon credits generated by the plantation. For that matter, they bought a part of the credits in advance, which allowed JMI to start its activities.



Design of the *Jatropha Curcas* project in Mali

[1] Malian government, *Stratégie nationale pour le développement des biocarburants*, 2008. p19, 24 etc.
[2] *Jatropha curcas* French name

JMI and its international agro-scientific partners develop technical support throughout the project, specifically developing best practices regarding variety selection, nursery technology and agroforestry management techniques. For the
past five years, JMI has been promoting a 3 500smallholders based agroforestry system in Mali by investing in and managing the establishment of sustainable *Jatropha curcas* plantations. The system consists in planting rows of Jatropha in association with other crops.

In Kita circle, the total area cultivated with crops at the start of the project is 157 000 ha and JMI aims to plant up to 15 000 ha of Jatropha by 2017 in this area.

	Planted					Forecast					
	2007	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Area (ha)	200	1000	500	1000	900	1400	2000	2000	2000	2000	2000

1.1.2 A community based approach (approved by Agence Française de Développement)

Jatropha is a rustic oilseed bearing tree, which adapts to a wide range of tropical climatic conditions. Jatropha has been present for years in the ecologically-suited Sudano-Sahelian belt as live fencing to protect gardens and food crops from livestock. According to recent studies, the Sahel today would count about 10,000 km of this type of fencing[3]. Its seeds contain at least 30% oil, which is used locally in JMI's project as a direct source of biofuel,to produce electricity or for the soap industry. Biofuel is used locally where fossil fuel access is very difficult. Mali has no easy access to the sea, so the demand for this kind of biofuel, which moreover is cheaper than fossil fuel, is very high. The sale of these products will allow JMI to insure sustainable revenue to its farmers partners. The by-product of the oil is a high quality organic fertilizer, used in the agroforestry systems. In addition, Jatropha trees sequestrate carbon. With an average of 1,200 trees per hectare, a plantation can sequestrate up to around 120 tCO2/ha over a period of 10 years.

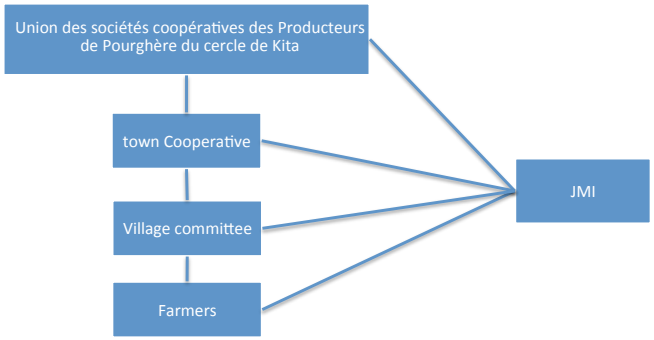


Jatropha

JMI has developed this agroforestry model on 3,250 hectares in Mali since 2007. The average size of a plantation plot is a bit less than one hectare, which means JMI works with over 3,500 farmers. Each farmer chooses its plantation plot(s) on his own non-forested land. Therefore, the project's numerous plantation plots are located all over Kita circle. In order to strengthen its partnership with local farmers,

[3]HENNING. *Utilisation des savoirs locaux sur le Jatropha*. Notes CA, 2002, n°47, p1.

JMI helps farmers them build strong professional organisation: in each village, there is a Jatropha farmers' group represented at the commune level by elected farmers of this group. Those representatives together form the communal cooperative, which elects its delegates, who will in turn represent the Jatropha farmers at the Union level.



JMI's commitment to communities

JMI's project is based on four pillars, which are the foundation of a sustainable and profitable partnership with and for the farmers. This model follows the FAO recommendations[4] as to how to introduce Jatropha as a smallholder cash crop:

- Jatropha is integrated into existing farming systems without jeopardizing food crop production;
- Long term contracts are signed, which guarantee grain purchase at a minimum price;
- Investment in agronomic research in farmers conditions to promote the most adapted cultivation practices and select high potential yielding varieties;
- Capacity building of field technicians who advise farmers on all aspects of Jatropha cultivation and the on the balance between Jatropha and foodcrops.

Farmers manage Jatropha establishment and maintenance, harvest, and seed sale from their plantations. The most important benefits of this joint venture to rural communities is the technical know-how and training provided by JMI as well as guaranteed long-term market access for the sale of Jatropha seeds. Both are crucial to ensure the project's sustainability, and would reasonably be lacking without the participation of JMI. In addition, JMI takes responsibility for managing the distribution of carbon credits revenue to rural communities, corresponding to their share of carbon sequestered. The joint venture constitutes the main driving force of the project, while working closely with rural communities. In return, rural communities agree to develop plantations in accordance with the standards and technologies recommended by JMI and sell their seed production to JMI. After thorough feasibility and impact studies to validate the "JMI model", the French Development Agency (AFD) and Novartis have agreed to finance part of JMI's activities development.

1.1.3 Benefits

The positive environmental impactsof the project are:

- Reduction of soil erosion;
- Restructuring of soils and improvement of soil fertility;
- Production of carbon neutral fuel and organic fertilizers and;

[4] IFAD-FAO, 2010, Jatropha : A Smallholder Bioenergy Crop. The Potential for Pro-Poor Development. Vol. 8 – 2010, Integrated Crop Management. p114

- Carbon sequestration.

The positive economic and social impact of the project are:

- A one hectare Jatropha plantation managed by a small holder family, generates, through the sale of grain, a sustained complementary income
- Part of the fund generated through the sale of carbon credits is shared by JMI with the farmers.

1.2 Sectoral Scope and Project Type

Sectoral scope: AFOLU
Project category: ARR
Project activity: revegetation and reforestation
The project is a grouped project.

1.3 Project Proponent

The project proponents are jointly JMI and Eco-Carbone. JMI has control and responsibility on the Mali *Jatropha curcas* plantation project and hires Eco-Carbone to develop the VCS documentation.

Jatropha Mali Initiative (JMI)
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+223 21 57 40 97
kitajmi@yahoo.fr

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15, Avenue de Ségur, Paris, France
+331 53 59 83 89
b.dupeloux@eco-carbone.com

1.4 Other Entities Involved in the Project

Novartis is involved in the Project as a shareholder of JMI (19%) and VCUs buyer.

Novartis International SA
Bâle,Suisse
+41 61 324 11 11

DéguessiVert is also involved as a shareholder of JMI (21%).

Déguessi Vert
Bamako, Mali

The Kita Jatropha Producers Cooperatives Union is the professionnal representation of the farmers who grow Jatropha in partnership with JMI-SA. The Union is in charge of all the organisation of the planting and commercialisation campaigns for Jatropha as well as the carbon actions with JMI

Union des sociétés coopératives des Producteurs de Pourghère
Kita, Mali

1.5 Project Start Date

June the 15th of 2007 corresponds to the first transplantation; it is thus the project starting date.

1.6 Project Crediting Period

Grouped project
Start date: June the 15th of 2007
End date: June 14h of 2047
Total length of the grouped project crediting period: 40 years

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project	X
Mega-project	

Year	Estimated GHG emission reductions or removals (tCO2e)
1	2
2	2
3	7
4	35
5	41
6	17
7	5
8	4
9	2
10	2
11	2
12	2
13	2
14	2
15	2
16	2
17	2
18	2
19	2
20	2
21	0
22	0
23	0
24	0
25	0

26	0
27	0
28	0
29	0
30	-98
31	0
32	0
33	5
34	33
35	39
36	16
37	3
38	2
39	0
40	0
Total estimated ERs	134
Total number of crediting years	40
Average annual ERs	3.4

1.8 Description of the Project Activity

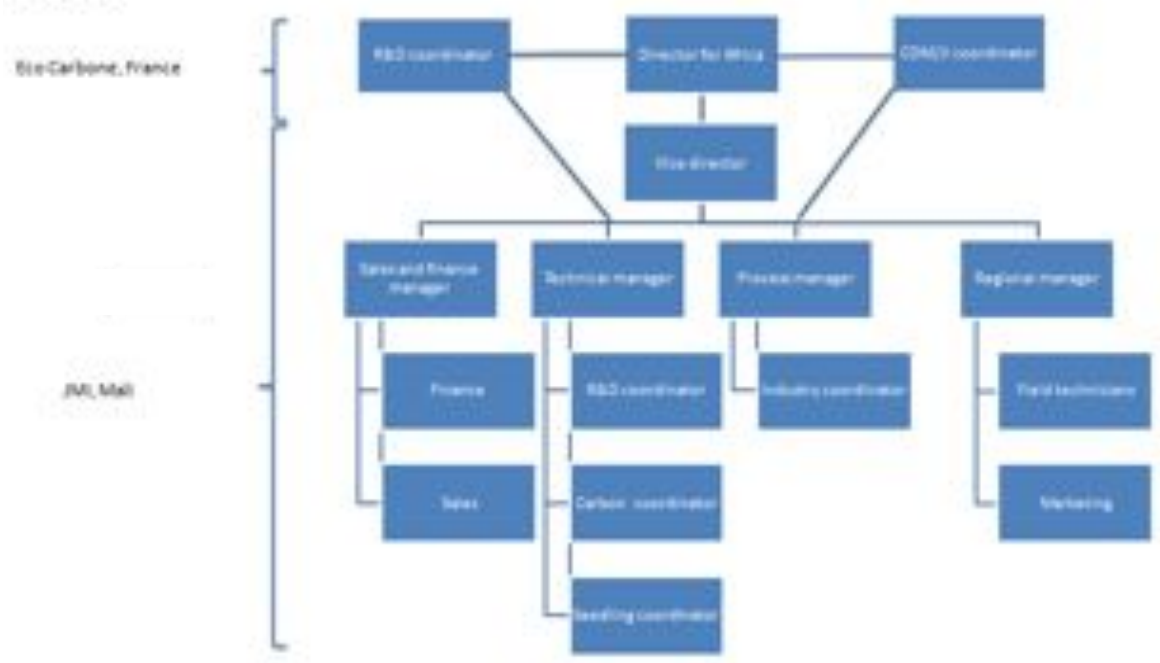
The main objectives of this Project activity is to introduce *Jatropha curcas* into agro-forestry systems within local communities in order:

- To sequester carbon through the planting of Jatropha. GHG emission reductions will be achieved by carbon sequestration in aboveground and belowground biomass through Jatropha trees' growth, and the increase of soil carbon stock mainly through erosion protection of soils by the trees.

- To alleviate poverty through an innovative community based approach. Long-term contracts for the sale of Jatropha fruits provide long-term revenues for local farmers.

1.8.1 Management structure

In 2011, JMI employs an organized team composed as follow:



One team of 12 local field technicians (FT) who all have at least an associate degree in agriculture or forestry;One of the field agents is specialized in digital data input, another in carbon management. When they integrate JMI's team, each FT is trained in Jatropha agroforestry techniques. Each FT is responsible for one or two communes of the Kita circle.

1.8.2 Field operations

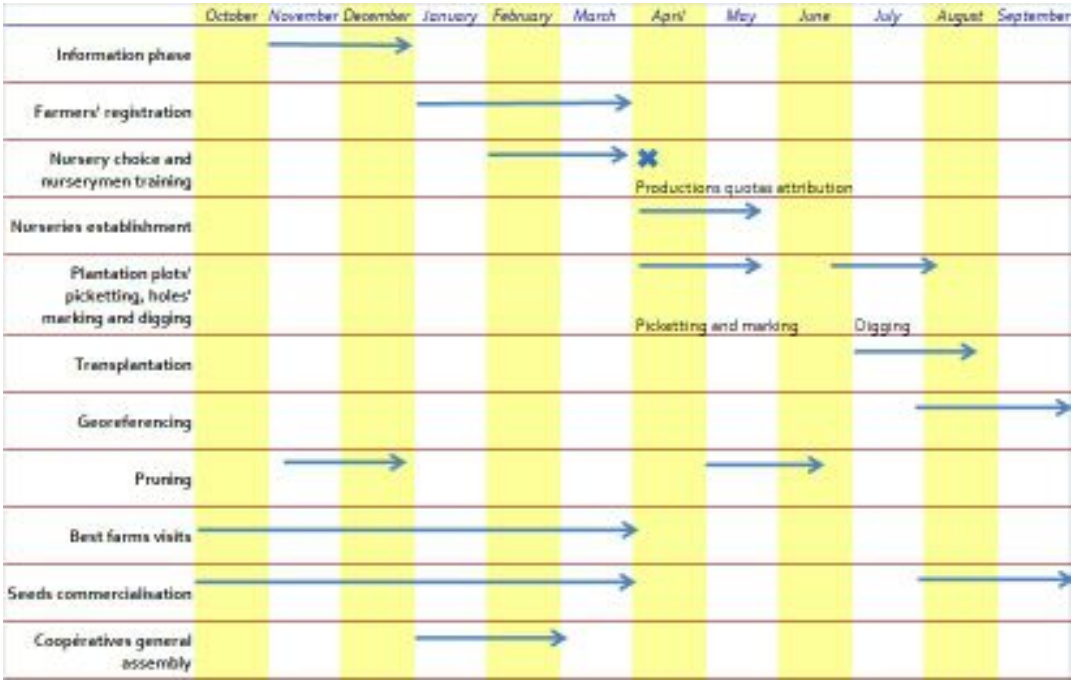


Figure 1: Annual planning of project activities

1.8.3 Participating farmers' registration

The project activities begin with an information phase. Each FT explains in each village of its commune(s) what the MJCPP consists in, from Jatropha plantation to seed sale, not forgetting the carbon credit part. Once the farmers understand what the project activities consist in, they chose or not to work with JMI. Each voluntary farmer proposes to plant Jatropha in an agroforestry system and his name is written down on a list by the FT in charge. Then, the FT verifies that the farmer has the customary right to plant on the land he proposes to. His plot will only be registered once the right has been checked. Each registered plot has a unique identification code in order to have an individual and proper monitoring[5].

1.8.4 Nurseries

On the basis of the plantation plots registry, JMI evaluates the quantity of seedlings to be produced for the plantation year and plans a 25% extra production to address the transplantation mortality rate. Seedling production is then split between three nursery models:

- Auto-nurseries
- Private nurseries
- JMI's own nurseries

When it is technically feasible, farmers are asked to produce seedlings for their own plantations. Those nurseries are called "auto-nurseries". If the farmer agrees, its dedicated FT provides him technical support for the nursery.On a contractual basis, JMI gives the seeds to the farmer who will plant all his seedlings on his own plot.

For farmers who cannot (for water or work force reasons in most of the case) or do not want to make their own seedlings, JMI asks private nurseries to grow the seedlings and creates also their own nurseries. In the case of private nurseries, on a contractual basis, JMI sells the seeds on credit to the persons in charge of the nursery and makes an advance payment of 20% of the value of the future seedlings, which JMI will buy. JMI also trains the nurseryman if it is his first production year. In the case of its own nurseries, JMI employs trained technicians to produce the seedlings.

Nursery type	Auto-nursery	Private nursery	JMI's own nursery
Legal arrangement	Contract	Contract	Employment
JMI's responsibilities	Gives the seeds on credit Support technically	Sell the seeds on credit Pay in advance for 20% of seedlings Support technically Pay 80% for 100% of healthy plants	Take all costs in charge Pays salaries Train technically
Nurseryman responsibilities	Grow the seedlings following JMI's technical advice Plant the seedlings on his own plot	Grow the seedlings following JMI's technical advice Reimburse the seeds on seedlings' sale	Grow the seedlings following JMI's technical advice

[5] The codification is detailed in Annex 4 describing the project's SOPs

Nurseries are established at the beginning of April and transplantation happens between the following end of June and mid-August.The nurseries are bareroot nurseries, and the techniques to install them have been described in a specific leaflet distributed to the FT[6].

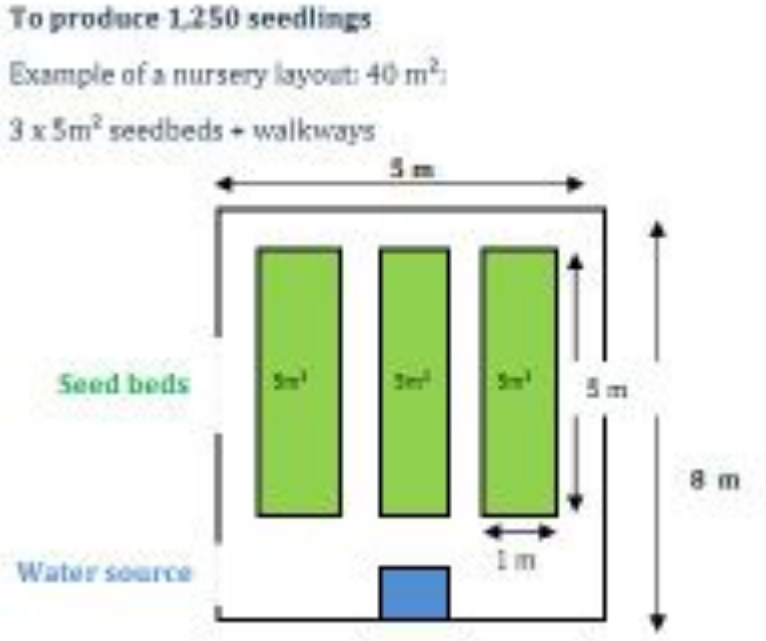
The inputs needed for the 1,250 seedlings are described in the table below:

N seeds	1,500 + 200 (replacement) = 1,700
N kg seeds	1,2 kg
Seed bed area	15 m^2
Total nursery area	40 m^2
Water volume (L/watering)	45 L / day
Fertilisation options	
Compost or Farm yard manure or Poultry manure	75 kg 75 kg 15 kg

JMI recommends to install nurseries on specific sites which gather the following conditions:

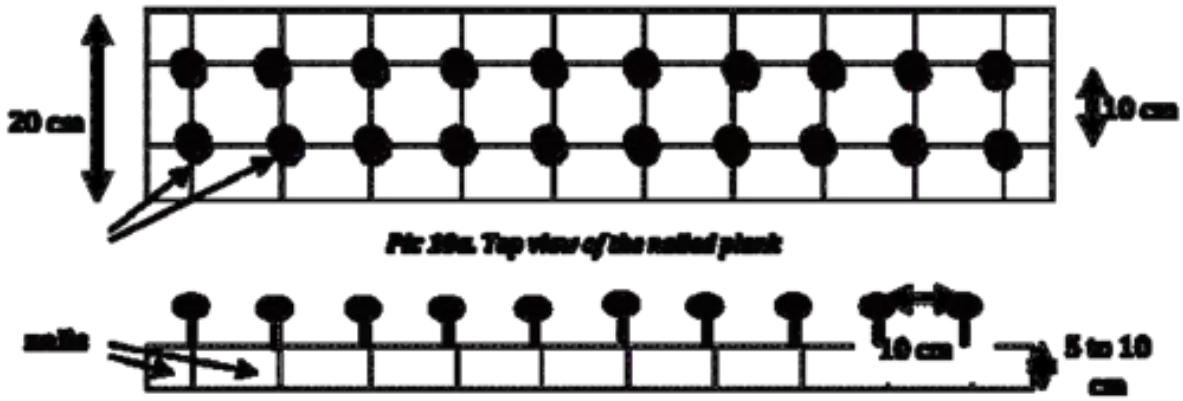
- Light sandy loam or loose-textured soil
- A reliable source of water close to the nursery site without risks of drying up
- Located within maximum 30 to 60 minutes of the plots where the seedlings will be transplanted.

Nurseries are organized as follow:



[6] Available on demand

Each seedbed is dug up and fertilized with local manure. Seeds are soaked in water for one night and sowed the day after with 10cmx10cm spacing on a 2cm depth. To facilitate the sowing, nurserymen can make nailed planks (see picture below):



Nurseries are shaded for 15 days after sowing to avoid direct sunlight on the leaves which may burn them.

Straw coverage of the nursery. The straw should be removed right after germination

Thin wire netting enables rain water to fall gently on the nursery while providing shade

Leaves are spread for shade on a light wooden frame over the nursery

A loose net is spread over the nursery

A tight net is spread over the nursery

Weeding is done mechanically. To protect seedlings against pests and diseases, local organic recipes are always used in the first intention. Chemical products are only use if the attack is too strong or biological mean has not been found yet. However, our R&D team is always testing new biological plant protection means in the objective to avoid the use of chemicals which are very expensive for the farmers and very harmful to the environment.

Figure 2: Malian jatropha nursery

Watering is done before sunset with buckets, or ideally a watering can, in order to maintain seedbeds moist but not flooded.

In order to be transplanted, plants will be uprooted. One week prior to uprooting, the stem's main part and 50% of the leaves are cut. Seedlings are uprooted carefully in order not to harm the roots. They are then transported to the transplantation plot.

1.8.5 Transplantation activities and plantations' management

A specific leaflet regarding plantation installation and management has been distributed to the FT[7]. FT train farmers to the different activities necessary to install the plantation plots.

[7] Available on demand

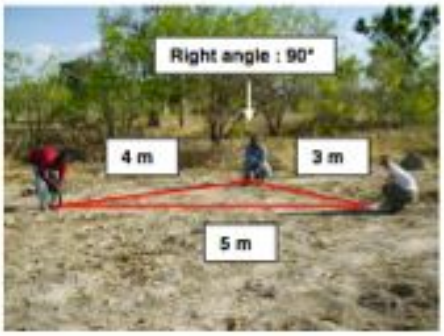
1.8.5.1 Soil preparation

Before the transplantation, farmers have to picket their plot and physically mark the future seedlings' plantation holes.

MEASUREMENT AND DIGGING

❖ **Equipment needed for land measurement:**

- One 30 m to 50 m measuring tape (**Picture 4**)
- Four 40 m long plastic thin rope marked with a marker every N meter depending on the chosen density
- One 15 m rope with a knot at 3 m, 7 m and 13 m from the same end, used to define right angles



Picture 4: Measuring tape

Picture 5. Mark the 40 m rope

❖ **Land digging**

The dimensions of the holes depend on the texture of the soil, its depth, porosity, the slope of the plot and the size of the seedlings' roots.

The seedlings' tap root needs to develop straight down in the soil. The four secondary roots should quickly develop within 40 cm around the tap root.

Therefore, the soil should:

- Have a **good drainage**: there should be absolutely no risk of water logging at the bottom of the hole. The bottom of the tap root should never touch the bottom of the hole especially if the soil is extremely compacted.
- Be **porous** to optimise exploration of the soil by the rooting system.
- **Be fertile:** adding a handful of manure or compost in the hole is a welcome booster for the seedling
- Be without **risk of pest contamination**: the soil needs to be sterilised either by burning or if available locally by adding 100 g of limestone in the hole.

Picture 9. soil with good texture and >40 cm deep 20 cm x 20 cm x 20 cm

Picture 10. Sandy loam

In a loose, porous, well structured soil, the holes can be 20 cm x 20 cm x 20 cm and less in sandy loam.

In a compacted soil, with a risk of either water logging at the bottom of the hole or water not penetrating in the soil at all, the holes should be up to 40 cm x 40 cm x 40 cm.

Picture 11. Very compact soil requiring a deeper and wider hole 40 x 40 x 40

Then, the holes must be ready by the time of transplantation, their digging usually beginning with the start of the rainy season. Those activities happen in April and May.

1.8.5.2 Intercropping

Different densities of trees are encountered among the farmers' plots (from 200 trees/ha to 1600 trees/ha). It is due to the type of agricultural systems. Crops are cultivated in between line of trees. The blue area represents the area where it is possible for the farmer to cultivate crops.

Jatropha are planted in line with a regular interspace.

A line is two rows of trees. Lines and rows are interspaced according to the farmer's choice among the set of density suggested by JMI

1.8.5.3 Transplantation

It shall be made according to the following recommendations :

- A pre-selection shall be made in order to select only Jatropha with straight roots

- Roots shall not be damaged, wounded or infected by any disease. They shall remain in humid conditions.
- Transport shall take less than half a day

1.8.5.4 Georeferencing

It shall be completed after the transplantation with GPS.

- The field technician walk first with the farmer to as to identify the plot boundary
- The field technicians then make another walk with the GPS on so as to georeference the plot.

- Measures are included in a GIS and a database.

1.8.5.5 Plantations management

Plantations should not be installed on soils where flooding or water stagnation can occur. Manure is mixed with soil in the transplantation hole. Farmers are recommended to cultivate intercrops or to hoe because when they do so, the plantation plot is not full of weed, so Jatropha is not in competition to survive the first years, and fire does not come into the plantation plot. Moreover, Jatropha will benefit from the organic fertilizer used on the intercrop.

Jatropha

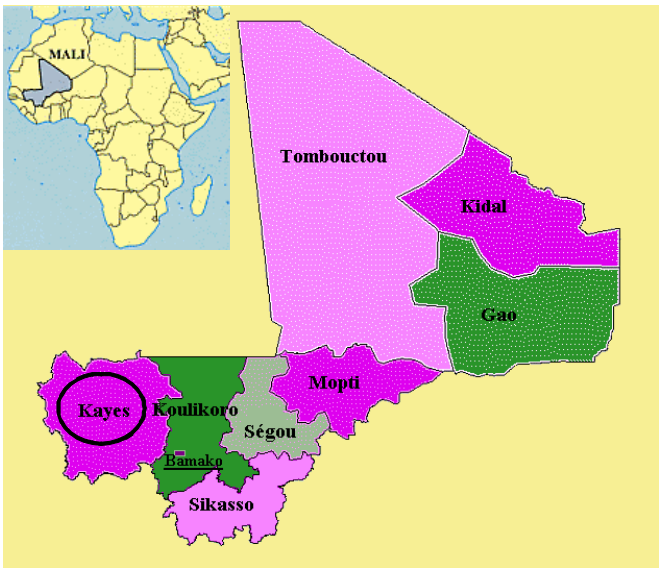
1.8.6 Other activities

All along the year, JMI organizes visits for the farmers to the best fields regarding the quality of trees. Farmers can discuss about their practices, which is a great added value to FT advice. In January and February, FT leads the general assembly of the communal cooperative. Seeds commercialization happens between August and March.

1.9 Project Location

1.9.1 Geographic area for the Grouped project

The project activity is located in the Sub-Sahelian and pre-guinean part of Mali, in the Kayes region, as shown below:



Map 1: Project region

The geographic area of the grouped project consists in the Kita circle, which is included in the Kayes region. The associated geodetic polygon of the Kita circle has been provided, and the area is shown below:[8]:

Map 2:Kita Circle of the Kayes region

[8] See Annex 26 : Kita.kml

1.9.2 Geographic area for the initial instance

The project activity instance (geodetic delineation of the first instance[9]) is within geographic area of the grouped project (Kita Circle). The here below picture represents the instance (yellow polygons) developed by JMI.

Inclusion	ID plot	Project location	Village
Instance 1	01_03_02_001_01	Instance #1.kml	Siraninkoto

Instance n°1

cf. section 1.13.1 – criteria (a)

1.10 Conditions Prior to Project Initiation

1.10.1 Conditions

Kita's agricultural exploitations all grow food and cash crops (peanut, cotton). Kita's farmers have grown cash crops since the 60's. From the 70's to the 80's, peanut has been the main cash crop in the region, its culture being supported by the State. Between the 80's and the 90's, the liberalization of peanut trade made its price decrease, as well as the peanut cultivated areas. In the 90's, cotton culture was introduced in Kita circle. The French Development Agency (AFD) and the Malian Textile Company (CMDT) financed it. However, in 2000, the world cotton price fell, and the CMDT was not able to pay the farmers as they expected. Since that time, cotton cultivated areas have decreased[10].

Jatropha is a welcomed diversification to those cash crops, allowing farmers to not be dependent on only one cash crop and therefore a single revenue source. JMI is working with farmers who chose a part of their own land to plant Jatropha on. Jatropha areas come in substitution of cotton or peanut areas, in order to diversify farmers' cash crops, consolidating their cash source.

[9] See Annex 26 : Instance #1.kml
[10] P.Clerino, *Introduction du Jatropha curcas L. dans les systèmes de productions du cercle de Kita, Mali ; dans le cadre d'un projet de reforestation générant des crédits carbone de séquestration*, Mémoire de master Diplôme d'Ingénieur Agroparistech, 2010.

1.10.2 AFOLU requirements version 3.2: eligible activities

"Eligible ARR activities are those that increase carbon sequestration and/or reduce GHG emissions by establishing, increasing or restoring vegetative cover (forest or non forest) through the planting, sowing or human-assisted natural regeneration of woody vegetation. Eligible ARR projects may include timber harvesting in their management plan. The project area shall not be cleared of native ecosystems within the 10 year period prior to the project start date, as set out in Section 3.1.5." Section 4.2.1

"Such proof is not required where such clearing or conversion took place at least 10 years prior to the proposed project start date." Section 3.1.5

There are two types of eligible lands for this project activity :

Slash and burn is common practice in the region as described in section 1.13.4. The project activity focuses on lands that are either croplands or fallow lands (cf. section 2.2.3). These lands have been subject to anthropogenic exploitation for at least 10 years according to the baseline study11. Therefore it is a sound and rational evidence that there has been no native ecosystem on these lands for more than 10 years.

- Satellite images study12 has been carried out to compare the forest situation between 1997 and 2007. Areas that did not match with the Malian forest definition under the UNFCCC in 1997 and 2007 are considered as eligible lands. There is no land use changes and no native ecosystem since it is either cropland or fallow land.

Satellite images study is to be carried out between 1997 and 2007. The analysis is based upon lands that fit the Malian forest definition under the UNFCCC. Clearing on these lands are therefore independent from the project activity since the start is later.

- Lands that have been cleared from “forest” in 1997 to “non forest” in 2007 are eligible lands for this project activity. The clearing occurred due to common practices (cf. baseline study) without any consideration of the project activity since the start is one year later, i.e. 2007. These lands had in addition no native ecosystems due to agriculture exploitation.

cf. section 1.13.1 – criteria (e)

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

In a letter dated 08 april 2010[13], the Agriculture Minister officially supports JMI and its action. This letter indicates that JMI's project activities are consistent with the Support and Development of Jatropha Program of the Agricultural Ministry. Moreover, Agricultural minister has indicated that the project activities will contribute to improve farmers' revenue, build the cooperatives' capacities and farmers' professionalization, and fight climate change.
JMI projects' activities abide by the Malian laws throughout its activity and its management structure .

Law	Compliance Issue	Demonstration of compliance

[11] Annex 25 : Baseline study, p38
[12] Annex 18 : eligible study.pdf
[13] Available on demand

Orientation agricole – Loi n°06-45 Code du travail – Loi n°92-20	Regulates treatment of farm workers, particularly Titre II Chapitre I which regulate matters relating to agriculture and livestock work	The working contracts of each member of the team is registered in labor inspection's registry.
Droit des coopératives – Loi n°1-076	Regulates relationship between worker and contracting party	The society is registered in the trade registry.
Code domanial et foncier Ordonnance n°00-027	Chapter III – section I assess and regulate the land tenure code	Farmers are in line with the land tenure code as they respect the customary law
Loi n°02-006	Chapter V – section 1 : Water must be used adequately and conservatively regarding scarcity.	Minimizing the use for water and optimizing its use has been developed in a leaflet for farmers. The design of nurseries takes into account this factor

1.12 Ownership and Other Programs

1.12.1 Proof of Title

According to the *Code Domanial et Foncier*[14] *du Mali*, non registered land is owned by the State, but customary law determines land tenure. As long as the State does not need the land, the customary law prevails *(cf. Section VII, Article 127)*. In the villages of Kita, like in most areas where small farmers predominate in Mali, customary law applies: the chief of the village is the official owner of the land around the village. He distributes land for cultivation to other family chiefs. A farmer is allowed to plant only where he is the official owner of the land, according to customary law[15]. Planting trees is an act of appropriation of the land. Therefore it lowers significantly the risk of unclear land tenure and potential for disputes.

Therefore Government owns the land and the community manages the land access and use rights. In every village committee have been held so as to provide transparent explanations on the carbon process. Proof of title shall be consistent with VCS requirements :

1. *"Have proof of title, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (ie, the date upon which the project activity instance began reducing or removing GHG emissions)"*

   Since the project has started in 2007, requirements regarding the VCS standard have undergone regular updates. Nonetheless the proposed project activity has always considered proof of title as a necessary mean to get a VCS registration. Contracts are signed between JMI and the farmer within the year of the transplantation.

   The signed contract between JMI and the farmer who is the holder of the first instance has been provided in annex 17. The year of transplantation fits with the year of the signature.

[14] See annex 7
[15] P.Clerino, *Introduction du Jatropha curcas L. dans les systèmes de productions du cercle de Kita, Mali ; dans le cadre d'un projet de reforestation générant des crédits carbone de séquestration*, Mémoire de master Diplôme d'Ingénieur Agroparistech, 2010.

2. *"An enforceable and irrevocable agreement with the holder of the statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission reductions or removals which vests the right of use in the project proponent."*

   This issue has been dealt at the early start of the proposed activity as mentioned in the environmental impact study[16]. Therefore due processes among communities have been taken to ensure that farmers are the holders of the contractual right in the land. The signed contract provided in annex 17 refers to land tenure in article 2. Jatropha producers are farmers that own their lands through the plantations.

3. *"Evidence shall be provided that proof of title (see the VCS Standard for specification of proof of title) can be maintained for the entire project longevity (eg, where control is secured through a concession that is shorter than the project longevity, such concession is renewable for the full longevity period being claimed)."*

   The project longevity is 40 years. The length of the carbon rights as described in the contract provided in annex 17 covers this period.

As a conclusion JMI has triggered due processes among villages regarding land tenure. Once ownership of the lands is clarified, JMI and farmers that have the contractual right in the land sign contracts within the year of the transplantation. This contract secures the proof of title for carbon credits for the whole project longevity. This has been supported through contracts for the first instance. However any additional instance are to follow a likewise process.

cf. section 1.13.1 – criteria (n)

1.12.2 Emissions Trading Programs and Other Binding Limits

N/A

1.12.3 Participation under Other GHG Programs

The project neither has been registered nor is seeking registration under any other GHG program

1.12.4 Other Forms of Environmental Credit

The project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.12.5 Projects Rejected by Other GHG Programs

This project has not been rejected by any other GHG program. However it has seek registration under the CDM but was withdrawn for two reasons:

- Project proponent was not able to define all the plantation plots before the validation.

[16] Annex 22, page 13

- The forest definition did not meet the proposed project activity, since it consists in revegetation rather than reforestation

1.13 Additional Information Relevant to the Project

1.13.1 Eligibility Criteria

As this project is a grouped project, any instance implemented after validation must comply with section 3.4.3 of the VCS Standard version 3.2. Therefore any instance shall meet the following eligibility criteria :

(a) The instance is part of the Kita Circle as defined in section 1.9.1

(b) Species planted is *Jatropha Curcas,*

Inclusion	Species
Instance 1	Jatropha

(c) Surface area is more than 0.05 hectares and trees are 2 meters height with a crown cover of at least 30%

Inclusion	Surface area (ha)
Instance 1	1

(d) The technology is intercropping, i.e. trees are planted evenly across the surface according to the plantation system proposed by JMI.

Inclusion	Plantation system
Instance 1	3x3

(e) The instance is either part of the eligibility map[17] that refers to areas “non forest” in 1997 and “non forest” in 2007 or part of areas where historic slash and burn practice has been proven i.e “forest” in 1997 and “non forest” in 2007

Inclusion	Village	Eligibility
Instance 1	Siraninkoto	eligible area

(f) It shall not exceed the UNFCCC small-scale limit (i.e. 16 000 tCO_2 per year)

(g) It shall not exceed 1% of the UNFCCC small-scale limit (i.e. 160 tCO_2 per year)

Inclusion	Max tCO2/year
Instance 1	4

(h) The pre project instance, i.e the instance before the establishment of the project, is either a cropland or a fallow land

(i) The crown cover of trees before the establishment of the project is less than 6%

[17] Annex 18

(j) The cultivated surface area for crops do not decrease due to the project activity of more than 20% of the surface prior to the project implementation.

(k) The instance has a unique ID and year of transplantation,is part of a GIS (geodetic polygons) and a database.

Inclusion	ID plot	Monitoring system
Instance 1	01_03_02_001_01	Part of the GIS and the database

(l) The start date of the instance for crediting shall be after 15 June 2007

(m) The end of the crediting period shall be 14 June 2047

(n) Low-income household is the holder of the contractual right in the land and it has a signed contract with JMI

Inclusion	Name	Proof of title
Instance 1	Sambou Kante	Holder of the contractual right in the land

These inclusion criteria have been defined to meet requirements regarding VCS standard v3.2 and the UNFCCC methodology AR-AMS004 v2.0.

(a) If criterion *(e)* is met then criterion (a) is automatically verified

(b),(c) These criteria ensure that the proposed project activity is either revegetation or reforestation as explained in section 2.4.

(d) According to section 1.8.5, JMI and the farmer agree to plant Jatropha with a specific system of plantation. Once the system of plantation is given, it verifies this criterion regarding the technology developed by the proposed project activity.

(e) This eligibility map represents areas within the Kita circle that have been not cleared of native ecosystems within the 10 years prior to the start date of the project activity. Any instance within the eligible area meets the eligibility criteria for ARR activities according to the AFOLU requirements version 3.2.

(f) This condition is automatically met if condition (g) and (n) is met. This enables to demonstrate two elements. The UNFCCC small-scale methodology is applicable. The baseline scenario is the continuation of the pre-project activity (cf. section 2.4)

(g) The proposed project activity shall meet the capacity limit requirements section 3.4.1 of the VCS standard version 3.2 (cf. section 2.2.2)

(h) This ensures that the *applicability condition (a)* of the AR-AMS004 v2.0 is met (cf. section 2.2.3). This is automatically verified since it has been demonstrated in section 2.2.3.

(b),(c),(d) This ensures that the *applicability condition (b)* of the AR-AMS004 v2.0 is met. Revegetation or reforestation activities allow for the introduction of a cropping regime (cf. section 2.2.3)

(i) This ensures that the *applicability condition (c)* of the AR-AMS004 v2.0 is met. This is automatically verified since it has been demonstrated in section 2.2.3.

(j) This ensures that the *applicability condition (d)* of the AR-AMS004 v2.0 is met. This is automatically verified since it has been demonstrated in section 2.2.3.

(k) These three elements enable a reliable and accurate monitoring of the instances as part of the grouped project (section 4.3.1). It prevents from double counting. Any VCUs claimed for an instance refer to a unique instance for a given period and a given amount of carbon removed. The unique ID is also assigned once contracts have been signed between JMI and the owner of the instances. Therefore a unique ID ensures that JMI has the proof of title regarding carbon rights

(l),(m) This ensures that the instance is eligible for the crediting period

(n),(a),(f) It has been demonstrated (section 2.5) at the grouped project level that the area is in majority low-income households facing investment, technological and social barriers. It ensures that the instance is in the similar area of the grouped project and it is consistent with additionality with the initial instance. It also confirms the baseline scenario determined in section 2.4

1.13.2 Leakage Management

Under AR-AMS0004 version 2.0 under section IV. 14, leakage is zero

1.13.3 Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

1.13.4 Further Information

Climate[18]

Located in the Sub-Sahelian and pre-guinean part of Mali, the zone is semi-arid to sub-humid. Its rainfall is between 550 and 1,100 mm. Because of the more abundant rainfall compared to the sahel zone, the agricultural activities are more intensive with a certain guarantee of success. Stock-rearing is sedentary with a seasonal migration; it is more and more integrated with crop production

Soil

The long dry season that lasts every year for several months leads to little vegetation. This scarcity of vegetation is one of the major issue as it speeds up soil erosion, a widespread problem[19]. The soils are ferruginous tropical ones with colluvions in the depressions. In Mali[20], organic carbon within soil is on average less than 1%. The first horizon is usually less than few centimetres.

[18] Jatropha.fao.org/ag/AGP/AGPC/doc/counprof/Mali/Mali.htm#3.%20CLIMATE%20AND%20AGRO%20ECOLOGICAL

[19] FAO, Gestion *de la fertilité des sols pour la sécurité alimentaire en Afrique subsaharienne*, 2003

[20] Agronomy for Sustainable Development, *Sequestration of organic carbon in West African soils by Aménagement en Courbes de Niveau,* June 2008

Ecosystem and Land use

Lands are organized in concentric circles around villages[21]. The first concentric circle called "soforo" encompasses all the lands within 150 meters from the village. This refers to croplands cultivated on a year basis such as corn. The second concentric circle called "kongoforo" refers to the following rotation in the wet season: cottons/mil, sorghum/peanut, cotton/mil, sorghum/cotton, peanut/mil, sorghum/peanut. In the dry season it is either fallows or clearing. The third and last concentric circle refers to "kongo" which is dedicated to wood fire, hunting and fruit picking.

In April and May, clearing is made with axes and machetes. It occurs on "kongo" lands whereas slash-and-burn occurs on "kongoforo" in order to clean lands from the previous harvest or spontaneous vegetation. Lands availability and lands property entice farmers[22] to have short-term agriculture. Slash-and–burn is commonly used to maintain at first soil fertility. On the long run it severely degrades soils.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Tools/guidelines/guidance applied for this grouped project

- AR-AMS0004 version 2.0 approved by the UNFCCC
  "Approved simplified baseline and monitoring methodology for small-scale agroforestry-afforestation and reforestation project activities under the clean development mechanism"

- Executive Board meeting 50th, Annex 13, Guideline 7
  "*guidelines for objective demonstration and assessment of barriers*"

- Executive Board meeting 46th, Annex 16
  "*guidance on conditions under which the change in carbon stocks in existing live woody vegetation are insignificant*" version 1.0

- Executive Board meeting 51th, Annex 14
  "*guidelines on conditions under which increase in ghg emissions attributable to displacement of pre-project crop cultivation activities in a/r cdm project activity is insignificant*" version 1.0

- Recommendation to questions/proposals/amendments to the simplified methodologies for small-scale A/R CDM project activity categories, SSC_AR_006, Working group 29 (9- 11 August 2010) "*Query regarding use of basal diameter of stem or root collar diameter in developing spec ies-specific allometric equations for calculating above-ground biomass of a living tree* "

- Tools approved by the UNFCCC
  "*Calculation of the number of sample plots for measurements within A/R CDM project activities*" version 2.1

[21] V. Ferault (INA P-G), *Analyse-diagnostic des systèmes agraires passés et actuels d'un village de la région de Kita au Mali,*1998
[22] Guy Faure *Valorisation agricole des milieux de savanes en Afrique de l'Ouest : des résultats contrastés*, dans Cahiers d'Outre-mer n°229 pp5-24. 2005

2.2 Applicability of Methodology

The proposed project activity is planting Jatropha with the use of intercropping system. The baseline scenario would have been the continuation of the crop management on lands with low or at steady state vegetation. Soils in the area of the proposed project activity are low in organic carbon. Therefore the UNFCCC methodology AR-AMS004 version 2.0 has been used: "Approved simplified baseline and monitoring methodology for small-scale agroforestry - afforestation and reforestation project activities under the clean development mechanism"

2.2.1 Revegetation

1) *"A direct human-induced activity to increase carbon stocks of woody biomass on sites through the establishment of vegetation that covers a minimum area of 0.05 hectares and does not meet the definitions of afforestation and reforestation"*

The project complies with the definition of revegetation in the VCS definition version 3.2

- The purpose of our activity is to plant directly a rustic oilseed bearing tree in Mali
- Planting trees will occur on farmer's lands which are more than 0.05 hectares
- The Malian DNA has defined in Mali a minimum of 2 meters, 30% of crown cover and 1 hectare to qualify a land as a forest. Since a Jatropha plantation of less than 1 hectare does not meet this criterion, it does not meet the definitions of afforestation or reforestation.

2) "*Application of the methodology under the revegetation activity does not negatively impact the conservativeness of the quantification of GHG emissions removals"*

The AR-AMS0004 version 2.0 is a dedicated afforestation and reforestation methodology. Revegetation differs only from forest definition due to the land surface area criterion. This does not impact negatively the conservativeness of the quantification since calculations are based on density of trees.

2.2.2 Small Scale activity

"Small-scale afforestation and reforestation project activities under the CDM are those that are expected to result in net anthropogenic greenhouse gas removals by sinks of less than 16 kilo tonnes of CO2 per year and are developed or implemented by low-income communities and individuals as determined by the host Party" (9/CMP.3).

- As Mali is part of the Least Developed Countries and many farmers (73%)[23] in the area still live below the national poverty level, it conservatively assesses that low-income communities are concerned by the project.
- No instances exceed 1% of the small scale UNFCCC capacity limit. Instances are therefore not assigned to clusters as defined in section 3.4.1 of the VCS version 3.2.

Either revegetation or reforestation are to meet the small-scale threshold; The UNFCCC AR-AMS004 version 2.0 can be used.

cf. section 1.13.1 – criteria (f) & (g)

[23] IFAD rural poverty portal : http://Jatropha.ruralpovertyportal.org/web/guest/home

2.2.3 Applicability conditions of AR-AMS0004 version 2.0:

1. (a) "Project activities are not implemented on grasslands"

Grassland is: "*This category includes rangelands and pasture land that is not considered as cropland*"[24]. Since 85% of the lands are used as croplands and the remaining 15% plots are fallow lands on which farmers have established their Jatropha plantation[25]

cf. section 1.13.1 – criteria (h)

(b) "Project activities lead to establishment of forest (according to area, height and crown cover thresholds reported to the EB by the host Party) and allow for continuation or introduction of a cropping regime";

- If the surface area of the instance is less than 1 hectare then it is revegetation and "the establishment of forest" is not applicable accordingly to the VCS guidance (cf. section 2.2.2)

- The Malian DNA has defined in Mali a minimum of 2 meters, 30% of crown cover and 1 hectare to qualify a land as a forest. A Jatropha plantation of more than 1 hectare with the lowest density (200 trees/ha) has a crown cover of more than 30% and a height of more than 2 meters according to public literature. Hence it does lead to the establishment of forest.

- Jatropha plantations are designed (section 1.8.5) to allow for continuation or introduction of a cropping regime. Interspaces enable the farmer to cultivate crops and to grow Jatropha at the same time.

As a conclusion the both activities allows for the introduction or the continuation of a cropping regime. The establishment of forest depends on the surface area of the instance but this condition is met by both of the proposed project activity

cf. section 1.13.1 – criteria (d)

(c) "The pre-project crown cover of trees within the project boundary is less than 20% of the threshold for crown cover reported to the EB by the host Party"

The Malian threshold is 30% and 20% of 30% is 6%. The project meets this condition for the following reasons :

- Once the contract has been signed with the farmer, JMI team performs an initial inspection to check the pre-project crown cover on the plot

- According to the baseline study, the weighted average of the pre-project crown cover of trees per villages within the project boundary is 5,7%

[24] IPCC, *Good Practice Guidance for LULUCF*, Annex – A, glossary, 2006, G.10
[25] P.Clerino, *Introduction du Jatropha curcas L. dans les systèmes de productions du cercle de Kita, Mali ; dans le cadre d'un projet de reforestation générant des crédits carbone de séquestration*, Mémoire de master Diplôme d'Ingénieur Agroparistech, 2010.

- Section II.2.(vi) of the "*guidance on conditions under which the change in carbon stocks in existing live woody vegetation are insignificant*" version 1.0, is applicable

  « Fire due to natural or anthropogenic causes, including due to slash-and-burn activities, is a common occurrence in the region the project is located in, and has occurred at least once in the area1 in the 10 years prior to project commencement— and the existing woody vegetation does not comprise a fire-adapted ecosystem »

  Bush fire is a traditionnal management by farmers in whole of Mali, but, contrary to an old believing, they are usually well mastered by local populations. In a very interesting article in Bois et Forêts des Tropiques, Paul Laris and Aziz Bakoury[26] have studied thoroughly farmers practices in Southwestern Mali, in the Kangaba circle, adjacent to Kita, and with the same populations and climate. Croplands are usually cultivated on a 3 to 5 years[27] cycle and fires are set off at the beginning of the cycle. Early fires are in fact mainly to protect cultivated areas and prevent accidental fires since there is no fire-adapted eco-system

As a conclusion slash-and-burn is a common occurrence in the land use practices. Fires occur at least once in Kita circle ten years prior to the start of the project activity. The existing woody vegetation does not comprise a fire-adapted eco-system and the pre-project crown cover is 5,7% which is below the threshold.

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cf. section 1.13.1 – criteria (i)

(d) *"If there is a decrease in the area cultivated with crops attributable to implementation of the project activity then the decrease is not more than 20% of the total area cultivated with crops at the start of the project"*

According to the AFD pre-feasability study[28] of the project activity in the Kita circle, traditional family farming systems mix food and cash crops. The farmers manage their lands through the diversification of crops and their rotation also with fallows, in order to fulfil their main objectives : 1. Food security and 2. Have a complementary income. These products from cash crops are then sold locally[29]. This traditional management aims to diversify and optimize land use and to preserve fertility on the long term. Fallow lands do not lead to any revenue for farmers, but are used to restore fertility. Thus decisions on what crop to plant and balance of cultivated areas between crops is thought of at the farm level, and should be considered as such.

- Jatropha curcas is considered as a traditional crop for communities but also for Malian authorities. The project proponent has undertaken actions to have endorsement for its project activity since the early start of the project. The

[26] *Nouvelles leçons d'une vieille pratique : mosaïque du feu dans la savane du Mali* Bois et Forêts des Tropiques, 2008, n°296 (2), pp 5-16

[27] P.Clerino, *Introduction du Jatropha curcas L. dans les systèmes de productions du cercle de Kita, Mali ; dans le cadre d'un projet de reforestation générant des crédits carbone de séquestration*, Mémoire de master Diplôme d'Ingénieur Agroparistech, 2010.

[28] Laval & Salvy, *Problématique de l'introduction du Jatropha dans les systèmes de production agricoles au Mali*, Avril 2009.

[29] P.Clerino, *Introduction du Jatropha curcas L. dans les systèmes de productions du cercle de Kita, Mali ; dans le cadre d'un projet de reforestation générant des crédits carbone de séquestration*, Mémoire de master Diplôme d'Ingénieur Agroparistech, 2010.

ministry of agriculture[30] has been identified as the entitled entity to deal with any crop related matter. In 2010, a letter of endorsement has been given to the proposed project activity that acknowledged crop diversification, i.e. Jatropha curcas, as an improvement and an enhancement for farmers' revenues in accordance with national targets and policies.

- *Section III.4.(b).(ii) of the "guidelines on conditions under which increase in GHG emissions attributable to displacement of pre-project crop cultivation activities in a/r cdm project activity is insignificant*" version 1.0, is applicable

  4.(b) The total area subjected to pre-project crop cultivation activities expected to be displaced is more than 5% of the entire A/R CDM project activity or more than 50 ha, and the n-a ha (where "n" is the area in ha expected to be displaced and "a" is 5% of the total project area or 50 ha) are displaced to:

  (ii) Existing cropland (i.e., area subjected to pre-project crop cultivation activities) managed in an extensive way subjected to an extensive management hence, allowing for increase of production without increasing their area (e.g., via improving crop rotation or change in the length of production/fallow periods).

  Agroforestry systems are currently developed through Jatropha plantations. Since Jatropha restores soil and provides shadows, at the plot level it enhances soil fertility and it improves crop conditions[31].

As a conclusion this proposed project activity through the establishment of agro-forestry systems is *a continuation of crops* cultivation with no decrease of the cultivated area nor displacement of GHG emissions. It secures at least an every year revenue from the sale of Jatropha fruits. Furthermore, the money from jatropha fruits comes during the rainy season, at a very difficult time, when food reserves are diminishing and new harvest has not started (traditionally known as the "soudure" (ii) agroforestry systems allow better soil fertility and humidity management and thus increases associated crop yield. It also allows the farmer to cultivate his plot longer, thus diminishing new clearings.

cf. section 1.13.1 – criteria (j)

4 . (a) "The project area is eligible for the A/R CDM project activity. Eligibility of the A/R CDM project activities shall be demonstrated by applying the latest version of the "Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities" as approved by the Executive Board";

As the project seeks registration under the VCS Standard, it is the VCS rules that take precedence (section 3.2 of VCS Standard version 3.2). It is therefore the eligibility criteria of VCS in section 4.2.1 of AFOLU requirements version 3.2that is used. The project activity area meets the condition as described in section 2.2.2

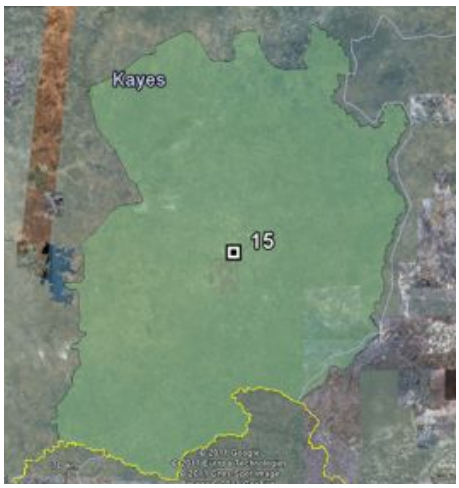
*(e) "The project activity is additional, using the procedures for the assessment of additionality contained in **Appendix A**."*

[30] Annex 33 : letter of endorsement from the minister of agriculture
[31] Marc Dufumier, *Famine au Sud, Malbouffe au Nord,* p106, 2012

Additionality of the project has been demonstrated according to Appendix A. An investment barrier and a technological barrier described in section 2.5 give such evidence.

2.3 Project Boundary

The project boundary corresponds to the Kita circle as showed on the map below:



Source		Gas	Included?	Justification/Explanation
Baseline	Baseline Removals	CO_2	N/A	The baseline scenario is the continuation of the land-use prior to the implementation of the project activity. In accordance with II.5 of the AR-AMS0004 version 2.0 methodology , the baseline net GHG removals by sinks are assumed to be insignificant and are accounted for as zero.
		CH_4	N/A	
		N_2O	N/A	
		Other	N/A	
Project	Project emisssions	CO_2	included	Under applicability conditions of this simplified methodology, the increase in emissions in the project above those that occur in the baseline is considered to be insignificant. However emissions due to harvesting are to be included. This explains the calculation of the long term average in section 3.4
		CH_4	N/A	
		N_2O	N/A	
		Other	N/A	
	Leakage	CO_2	N/A	Under IV.14 of the AR-AMS0004 version 2.0 methodology, Leakage is considered to be insignificant and is accounted for as zero
		CH_4	N/A	
		N_2O	N/A	
		Other	N/A	
	Project removals	CO2	Included	Planting Jatropha does capture CO2 and it is the aim of the proposed project activity.
		CH4	N/A	

Source		Gas	Included?	Justification/Explanation
		N2O	N/A	
		Other	N/A	

2.4 Baseline Scenario

Baseline is confirmed by the additionality of the project and provided by the AR-AMS0004 version 2.0, section II.5 :

> *"The most plausible baseline scenario of the small-scale A/R CDM project activity is continuation of the land-use prior to the implementation of the project activity"*

The Continuation of the pre-project land use: slash-and-burn agriculture. Since all the studies carried out until then have focused on the grouped project area, i.e. Kita circle, the baseline scenario is conservatively the same for the entire area. Instances that are included in this grouped project shall comply with eligibility criteria (f)

2.5 Additionality

Since Mali is part of the Least Developed Countries, the EB 50 Annex 13 *"guidelines for objective demonstration and assessment of barriers"* is applicable to the project.

> *"Guideline 7*
> *For projects in Least Developed Countries it is sufficient to transparently describe the relevant barriers, as less stringency is needed with regards to data availability in the actual demonstration of barrier, as compared to the projects in other countries. Projects in Least Developed Countries are not bound by the provisions in this guideline and may use other approaches that are more adapted to the local circumstances."*

Since all the instances are to be implemented in the Kita circle and all the studies carried out until then have focused on this area, additionality is conservatively the same for all the instances included provided that they meet the eligibility criteria (n) specific to additionality and geographic area. Regarding the fourth condition of AR-AMS0004 version 2.0, its Appendix A shall be used to assess additionality. Appendix A refers to the following condition:

> *" PPs shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers"*

1. ***Investment barriers, other than economic/financial barriers,*** *inter alia*

   (a) Lack of access to credit.

   According to Malian press[32], rural loans access is facing a lot of difficulties, such as:
   - A poor geographical repartition of primary banks and financial establishments throughout the country

32 **Agriculture - Les capitaux privés à l'assaut du secteur in** Le Républicain 29/12/2004 http://Jatropha.malipages.com/presse/news_12_04/news_0089.asp

- A bad quality of credit portfolio in rural areas
- Inappropriate offer regarding rural demand
- High cost of services related to loans

According to a work group[33] between Renée Chao-Béroff (CIRD[34]), André Chomel (créditcoopératif[35]), and Christophe Lebègue (CFSI[36]), primary banks such as BNDA (Agricultural Development National Bank) only lend money to guaranteed and organized sectors such as cotton and rice. Rural loans offer is not sufficient and farmers have an access problem to it. Moreover, there is no micro-finance mid/long term offer, which would be essential to farmers in the project case because they would only be able to repay four years later, as the income from Jatropha seeds sale will occur only four years after the establishment of the plantations.

2. Technological barriers, *inter alia*

(a) Lack of skilled and/or properly trained labour force;

Oral interviews with rural communities indicate that they have difficulties accessing Jatropha quality seedling and lack skills for producing high quality seedlings and for successful tree planting, pruning, as well as protecting planted trees from fire, pest and disease.

3. Barriers due to social conditions*, inter alia*

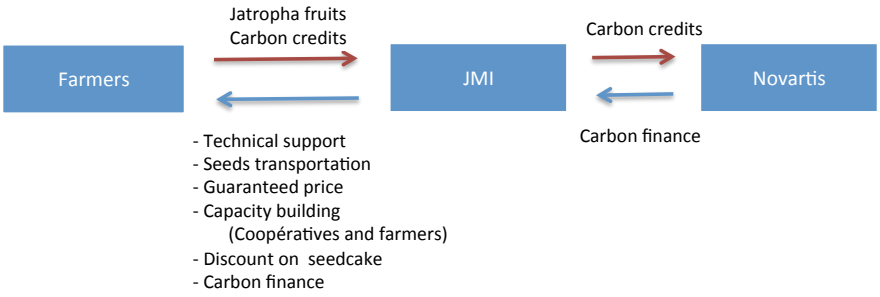
(b) Lack of organization of local communities.

The Jatropha biofuel production sector does not exist at the time of project start in Mali and needs to be developed at all levels. Farmers lack of training to manage efficiently production techniques and know-how about yield improvement. Rural communities have traditionally been involved in the production of goods that can be sold directly on local markets. Jatropha biofuel, however, involves a more complex process from investment to production and transformation, and national marketing, which these communities are in a too weak position to manage. In addition, the lack of organization and management structure also prevents them from overcoming the barriers mentioned above.

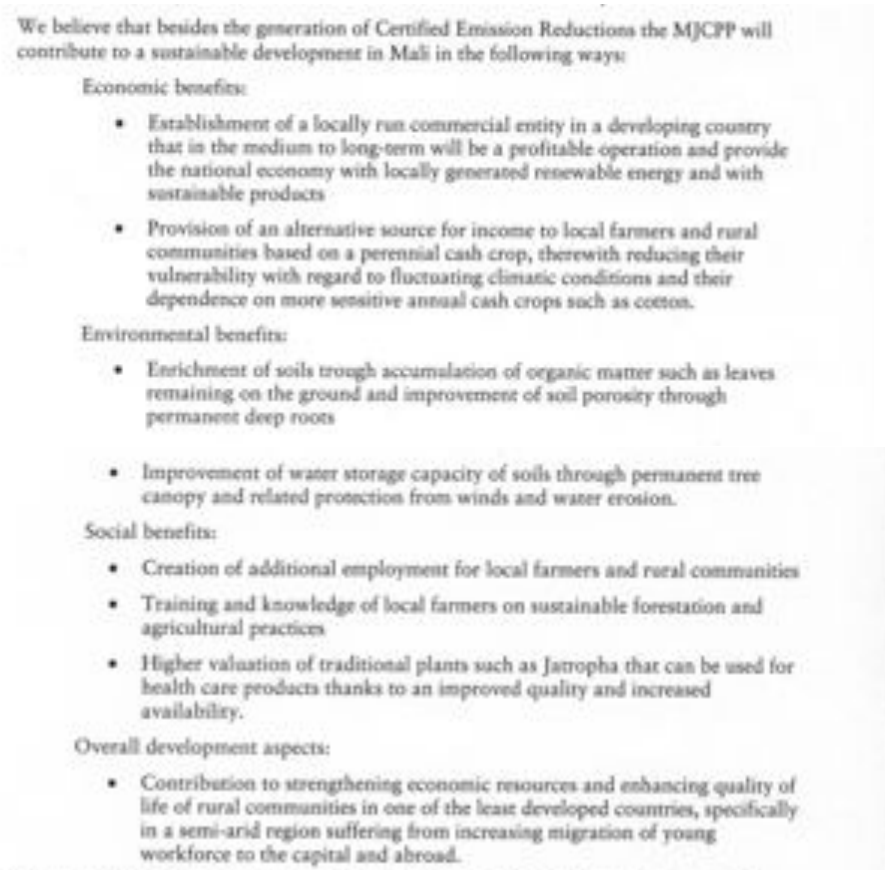
Since the three here above barriers described would have prevented the implementation of our project activity, and according to the AR-AMS004 version 2.0 additionality assessment our project is deemed to be additional.

The three barriers are alleviated through the tailor-made JMI's funding to farmers as described with the following scheme :

33 Le marché financier rural au Mali, groupe de travail « financement des exploitations agricoles dans les pays en développement » 2000 http://Jatropha.lamicrofinance.org/files/15520_mso16550.pdf
34 http://Jatropha.cidr.org/
35 http://Jatropha.credit-cooperatif.fr/
36 http://Jatropha.cfsi.asso.fr



Novartis has agreed from the start to finance the Jatropha project through carbon finance (14 December 2007) with the here-below objectives. Novartis has therefore purchased all the carbon credits upfront from this project under the VCS standard. Without Novartis funding the project would not have occurred at all.



We believe that besides the generation of Certified Emission Reductions the MJCPP will contribute to a sustainable development in Mali in the following ways:

Economic benefits:

- Establishment of a locally run commercial entity in a developing country that in the medium to long-term will be a profitable operation and provide the national economy with locally generated renewable energy and with sustainable products
- Provision of an alternative source for income to local farmers and rural communities based on a perennial cash crop, therewith reducing their vulnerability with regard to fluctuating climatic conditions and their dependence on more sensitive annual cash crops such as cotton.

Environmental benefits:

- Enrichment of soils trough accumulation of organic matter such as leaves remaining on the ground and improvement of soil porosity through permanent deep roots
- Improvement of water storage capacity of soils through permanent tree canopy and related protection from winds and water erosion.

Social benefits:

- Creation of additional employment for local farmers and rural communities
- Training and knowledge of local farmers on sustainable forestation and agricultural practices
- Higher valuation of traditional plants such as Jatropha that can be used for health care products thanks to an improved quality and increased availability.

Overall development aspects:

- Contribution to strengthening economic resources and enhancing quality of life of rural communities in one of the least developed countries, specifically in a semi-arid region suffering from increasing migration of young workforce to the capital and abroad.

The registration of this project activity enables JMI to deliver carbon credits to Novartis. In the meanwhile it enables JMI to develop the project activity and hence to provide services that remove the barriers as described previously.

1. Investment barriers, other than economic/financial barriers, inter alia

(a) *Lack of access to credit.*

Thanks to Novartis funding, JMI provides long-term contracts with a guaranteed minimum price for the purchase of grains. This revenue comes later (September) than food crops revenues (June). It is the dry period referring as the challenging period for farmers to meet both ends. Therefore Jatropha plantation is for them an opportunity to diversify and strengthen their revenues on a whole year basis. This will enable them to claim for an access to credit or at least with better conditions.

2. Technological barriers, inter alia

(a) *Lack of skilled and/or properly trained labour force*

JMI implements and manage all the field operations, including technical advice and relations with contract farmers who have established Jatropha on their land. Novartis through the purchase of the carbon credits has provided all the necessary funding to enable the beginning of these activities from the early start in 2007. Supporting activities such as technical or training activities require an every day commitment to farmers. This commitment has however a cost and Novartis through the proposed project activity has provided the essential support for its every day development.

Barriers due to social conditions, inter alia

(a) Lack of organization of local communities.

JMI provides, through local nurseries, Jatropha seedlings to farmer communities who want to plant Jatropha on their land. JMI owns and operates industrial units to process the seeds for the production of oil and seedcake. Organizational activities as well as industrial processes are capital intensive. Funds from Novartis enabled JMI to develop a sustainable and reliable activity at every stage of the involved processes.

2.6 Methodology Deviations

There is no methodology deviation

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

The baseline scenario is the continuation of the land-use prior to the implementation of the project activity. In accordance with the AR-AMS0004 version 2.0 methodology :

1. The most plausible baseline scenario of the small-scale A/R CDM project activity is continuation of the land-use prior to the implementation of the project activity.

In accordance with applicability conditions of this methodology, the baseline net GHG removals by sinks are assumed to be insignificant and are accounted for as zero.

2. Therefore:

$$\Delta C_{BSL,t} = 0 \qquad \textbf{(1)}$$

where:

$\Delta C_{BSL,t}$	*The sum of the changes in carbon stocks in the living biomass of trees and soil organic carbon in the absence of the project activity for year t; t CO_2-e yr^{-1}*
t	*1, 2, 3, … t^ years elapsed since the start of the A/R CDM project activity*

3.2 Project Emissions and Removals

Carbon pools	Included?	Justification/Explanation
Above-ground biomass	Yes	Major carbon pool subjected to project activity
Below-ground biomass	Yes	Below-ground biomass stock is expected to increase due to the implementation of the A/R CDM project activity
Dead wood	No	Not considered in the chosen methodology
Litter	No	Not considered in the chosen methodology
Soil organic carbon (SOC)	Yes	Considered in the methodology for soils which are not organic soils, which is the case for all strata of the project

3.2.1 Project emissions

In accordance with applicability conditions number 3 of AR-AMS0004 version 2.0, the increase in emissions in the project above those that occur in the baseline is considered to be insignificant.

However emissions due to harvesting are to be included. The proposed project activity is to plant Jatropha from 2007 to 2017. Since it is a grouped project the crediting period shall be consistent with 3.3.2 of the AFOLU requirements: VCS version 3.2. Jatropha is expected to have a 30 years lifespan[37] Therefore the crediting period shall encompass the last year of plantation and then the lifespan. As a result the crediting period for the grouped project is 40 years.

The long term average is considered on the 40 years period. This period ensures that the last Jatropha planted in 2017 with a 30 years lifespan is consistent with Scenario 4 of the *AFOLU Guidance : Example for Calculating the Long-Term Average Carbon Stock for ARR Projects with Harvesting*. (8 March 2011, VCSA)

Calculations for the long term average are according to AFOLU requirements 3.2 section 4.5.4 6) :

$$LA = \frac{\sum_{t=0}^{n} PE_t - BE_t}{n}$$

Where:

LA = The long-term average GHG benefit

PE = The GHG emission reductions and removals generated in the project scenario (tCO_2e). Project scenario emission reductions and removals shall also consider project emissions of CO_2, N_2O, CH_4 and leakage.

BE = The GHG emission reductions and removals projected for the baseline scenario (tCO_2e)

t = Year

n = Total number of years in the established time period

[37] Achten et al, *Towards domestication of Jatropha curcas,* 2010, table 4

3.2.2 Project removals

Project removals are considered and calculated following AR-AMS0004 version 2.0 as described below :

The **actual net greenhouse gas removals by sinks** in year *t* are equal to:

$$\Delta C_{ACTUAL,t} = \Delta C_{PJ,t} \quad \textbf{(2)}$$

where:

$\Delta C_{ACTUAL,t}$	Actual net greenhouse gas removals by sinks in year *t*; t CO_2-e yr^{-1}
$\Delta C_{PJ,t}$	Project GHG removals by sinks in year *t*; t CO_2-e yr^{-1}

3. Project GHG removals by sinks are calculated as follows:

$$\Delta C_{PJ,t} = \sum_{i=1}^{I} \Delta C_{project,i,t} \cdot 44/12 \quad \textbf{(3)}$$

$$\Delta C_{project,i,t} = \frac{C_{trees,i,t_2} - C_{trees,i,t_1}}{T} + \Delta C_{soil,t} \quad \textbf{(4)}$$

where:

$\Delta C_{PJ,t}$	Project GHG removals by sinks in year *t*; t CO_2-e yr^{-1}
$\Delta C_{project,i,t}$	Average GHG removals by living biomass of trees and soil for stratum *i*, for year *t*; t C yr^{-1}
$C_{trees,i,t}$	Carbon stock in living biomass of trees for stratum *i*, at time *t*; t C
$\Delta C_{soil,t}$	Average annual change in carbon stock in soil organic matter for stratum *i*, for year *t*;t C yr^{-1}
T	Number of years between years t_2 and t_1

This project uses the Allometric method to evaluate the carbon stock in living biomass of trees

STEP 1

The allometric equation used for Jatropha is a function of basal diameter (B_D). The use of this parameter instead of *DBH* is allowed by Recommendation to questions/proposals/amendments to the simplified methodologies for small-scale A/R CDM project activity categories, SSC_AR_006, Working group 29 (9-11 August 2010) "*Query regarding use of basal diameter of stem or root collar diameter in developing spec ies-specific allometric equations for calculating above-ground biomass of a living tree* "

For *ex-ante* estimations, calculation will be based on a table of basal diameter (B_D) as a function of age[38].

According to field measurement, the maximum basal diameter is 20 cm for a four years old Jatropha. We assume Jatropha will grow further, but in order to stay conservative for the ex-ante estimations, a maximum of 20 cm basal diameter is considered.

STEP 2

The species-specific allometric equation[39] gives the above ground biomass per tree $(\mathrm{f_j},\ \mathrm{td.m.})$ as a function of basal diameter $(\mathrm{B_D},\ \mathrm{mm})$. Once this is multiplied by the density of trees and the surface of the instance, the above ground biomass in the strata is calculated.

[38] See Annex 11

$$fj(B_D) = \frac{a \cdot \mathrm{B_D}^{b}}{10^6}$$

$$a \approx 2.83 \cdot 10^{-4}$$

$$b \approx 3.529$$

STEP 3

$$C_{AB,i,sp,j,t} = \sum_{l=1}^{N_{l,sp}} CF_j \cdot f_j(DBH, H) \quad \textbf{(5)}$$

where:

$C_{AB,i,sp,j,t}$	Carbon stock in above-ground biomass of trees of species *j,* on sample plot *sp,* for stratum *i*; t C
CF_j	Carbon fraction of dry matter for species or group of species type *j*, t C (t d.m.)$^{-1}$
$f_j(DBH,H)$	An allometric equation linking above-ground biomass of a living tree (t d.m.) to mean diameter at breast height (*DBH*) and possibly tree height (*H*) for species *j*, at time *t*; t d.m Note: For *ex ante* estimations, mean *DBH* and *H* values should be estimated for stratum *i,* at time *t* using a growth model or yield table that gives the expected tree dimensions as a function of tree age. The allometric relationship between above-ground biomass and *DBH* and possibly *H* is a function of the species considered.
i	*1, 2, 3, …* M_{PS} strata in the project scenario
j	*1, 2, 3, …* S_{PS} tree species in the project scenario
l	*1, 2, 3, …* $N_{i,sp}$ sequence number of individual trees of species *j,* in sample plot *sp*
t	*1, 2, 3, …* t^* years elapsed since the start of the A/R CDM project activity

The sample plot is defined in a conservative manner as the whole instance. The carbon fraction chosen is the IPCC value.

Step 4: Convert the carbon stock in above-ground biomass to the carbon stock in below-ground biomass via root-shoot ratio, given by:

$$C_{BB,i,sp,j,t} = C_{AB,i,sp,j,t} \cdot R_j \quad \textbf{(6)}$$

where:

$C_{BB,i,sp,j,t}$	Carbon stock in below-ground biomass of trees of species *j,* in plot *sp,* in stratum *i,*for year *t*; t C
$C_{AB,i,sp,j,t}$	Carbon stock in above-ground biomass of trees of species *j,* in plot *sp,* in stratum *i,*for year *t*; t C
R_j	Root-shoot ratio appropriate for biomass stock, for species *j*; dimensionless

The Root-shoot ratio is the IPCC value.

Step 5: Calculate total carbon stock in the living biomass of all trees present in the sample plot *sp*in stratum *i*at time *t*.

[39] SB Ghezei, JG Annandale and CD Everson, Shoot allometry of *Jatropha curcas*, *Southern Forests,*2009

$$C_{tree,i,sp,t} = \sum_{j=1}^{S_{PS}} (C_{AB,i,sp,j,t} + C_{BB,i,sp,j,t}) \quad (7)$$

where:

$C_{tree,i,sp,t}$	Carbon stock in living biomass of trees on plot *sp* of stratum *i,*for year *t*; t C
$C_{AB,i,sp,j,t}$	Carbon stock in above-ground biomass of trees of species *j,* in plot *sp,* in stratum *i,*for year *t*; t C tree^{-1}
$C_{BB,i,sp,j,t}$	Carbon stock in below-ground biomass of trees of species *j,* in plot *sp,* in stratum *i,*for year *t*; t C tree^{-1}
i	*1, 2, 3, …* M_{PS} strata in the project scenario
j	*1, 2, 3, …* S_{PS} tree species in the project scenario
t	*1, 2, 3, …* t^* years elapsed since the start of the A/R CDM project activity

All the carbon stock in the living biomass of *Jatropha curcas at a given basal diameter*

STEP 6

$C_{tree,i,t}$ is calculated using equation (8) of AR-AMS0004:

$$C_{tree,i,t} = \frac{A_i}{Asp_i} \sum_{sp=1}^{P_i} C_{tree,i,sp,t} \quad (8)$$

where:

$C_{tree,i,t}$	Carbon stock in living biomass of trees in stratum *i*, for year *t*; t C
$C_{tree,i,sp,t}$	Carbon stock in living biomass of trees on plot *sp,* of stratum *i,*for year *t*; t C
Asp_i	Total area of all sample plots in stratum *i*; ha
A_i	Area of stratum *i*; ha
sp	*1, 2, 3, …* P_i sample plots in stratum *i* in the project scenario
i	*1, 2, 3, …* M_{PS} strata in the project scenario
t	*1, 2, 3, …* t^* years elapsed since the start of the A/R CDM project activity

In accordance with section 1.13.1, $A_i = Asp_i$ and sp=1 therefore equation (8) is equal to equation (7).

3.2.3 Soil Organic Carbon

Organic soil is defined[40] as such if it meets at least the following condition:

(1) Thickness of 10 cm or more. A horizon less than 20 cm thick must have 12 percent or more organic carbon when mixed to a depth of 20 cm;

[40] IPCC, *Good Practice Guidance for LULUCF,* Glossary Annex A, G.14

Considering thickness and carbon content as described in section 1.13.4 of this document, Malian soils do not meet the here above condition. Strata in the scope of this grouped project can conservatively be considered as strata that do not contain organic soil.

$$\Delta C_{soil,i,t} = A_i \cdot \Delta C_{agroforestry,i} \text{ for } t \leq t_{equilibrium,i}$$
$$\Delta C_{soil,i,t} = 0 \text{ for } t > t_{equilibrium,i} \quad \textbf{(9)}$$

where:

$\Delta C_{soil,i,t}$	Average annual change in carbon stock in soil organic matter for stratum *i*, for year *t*; t C yr^{-1}
A_i	Area of stratum *i*; hectare (ha)
$\Delta C_{agroforestry,i}$	Average annual increase in carbon stock in soil organic carbon pool for agroforestry system in stratum *i*; t C ha^{-1} yr^{-1}
$t_{equilibrium,i}$	Time from start of the project activity until a new equilibrium in carbon stock in soil organic matter is reached for agroforestry system in stratum *i*;years

The default value of $\Delta C_{agroforestry,i}$ = 0.5 t C ha^{-1} yr^{-1} and a $t_{equilibrium,i}$ of 20 years shall be used. Changes in carbon stock in soil organic matter are not monitored *ex post*.

According to equation (14),

$$C_{AR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

According to the AR-AMS0004, $\Delta C_{BSL,t} = LK_t = 0$

3.3 Leakage

In accordance with applicability condition 1.(d) of AR-AMS0004, possible displacement of activities or people that would be attributable to the small-scale afforestation or reforestation project activity under the CDM is assumed to be insignificant and the leakage is accounted for as zero.

3.4 Summary of GHG Emission Reductions and Removals

t (year)	B_t (mm)	$f_1(B_t)$ (t d.m./tree)	$f_2(B_t)$ (crown m2/tree)	$C_{BSL,t}$ (tC)	$C_{BSL,t-1}$ (tC)	$C_{WP,t-1}$ (tC)	$C_{SR,t-1}$ (tC)	$\Delta C_{SOIL,t}$ (tC)	$\Delta C_{P,t}$ (tC)	$\Delta C_{BSL,t}$ (tCO_2e)	$\Delta C_{ACTUAL,t}$ (tCO_2e)
1	8	0	0	0.01	0.01	0	0	0.5	0.5	1.84	1.84
2	30	0	0	0.03	0.01	0	0	0.5	0.54	1.96	1.96
3	86	0	3	1.05	0.32	1	1	0.5	1.83	6.7	6.7
4	153	0	9	7.98	2.4	10	10	0.5	9.52	34.89	34.89
5	187	0	13	16.2	4.86	21	21	0.5	11.19	41.02	41.02
6	197	0	15	19.47	5.85	25	25	0.5	4.76	17.42	17.42
7	199	0	15	20.18	6.06	26	26	0.5	1.42	5.21	5.21
8	200	0	15	20.54	6.17	27	27	0.5	0.97	3.55	3.55
9	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
10	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
11	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
12	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
13	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
14	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
15	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
16	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
17	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
18	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
19	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84
20	200	0	15	20.54	6.17	27	27	0.5	0.5	1.84	1.84

Year	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)	Expected total GHG benefit to-date (tCO2e)	VCUs (tCO2e)
1	0	2	0	2	2	2
2	0	2	0	2	4	2
3	0	7	0	7	11	7
4	0	35	0	35	46	35
5	0	41	0	41	87	12
6	0	17	0	17	104	0
7	0	5	0	5	109	0
8	0	4	0	4	113	0
9	0	2	0	2	115	0
10	0	2	0	2	116	0
11	0	2	0	2	118	0
12	0	2	0	2	120	0
13	0	2	0	2	122	0
14	0	2	0	2	124	0
15	0	2	0	2	126	0
16	0	2	0	2	127	0
17	0	2	0	2	129	0
18	0	2	0	2	131	0
19	0	2	0	2	133	0
20	0	2	0	2	135	0
21	0	0	0	0	135	0
22	0	0	0	0	135	0
23	0	0	0	0	135	0
24	0	0	0	0	135	0
25	0	0	0	0	135	0
26	0	0	0	0	135	0
27	0	0	0	0	135	0
28	0	0	0	0	135	0
29	0	0	0	0	135	0
30	0	-98	0	-98	37	0
31	0	0	0	0	37	0
32	0	0	0	0	37	0
33	0	5	0	5	42	0
34	0	33	0	33	75	0
35	0	39	0	39	114	0
36	0	16	0	16	130	0
37	0	3	0	3	133	0
38	0	2	0	2	135	0
39	0	0	0	0	135	0
40	0	0	0	0	135	0
				Sum (tCO2e)	4 189	57
				Long Term Average (tCO2e)	105	
				Buffer	45.5%	

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	CF_j
Data unit:	t C (t d.m.)$^{-1}$
Description:	Carbon fraction of dry matter for species of type *j*
Source of data:	A default IPCC value
Value applied:	0.5 t C (t d.m.)$^{-1}$.
Justification of choice of data or description of measurement methods and procedures applied:	As per applied methodology
Any comment:	

Data Unit / Parameter:	$f_j(B_D)$
Data unit:	td.m.
Description:	The species-specific allometric equation gives the above ground dry biomass $(f_j, \text{td.m.})$ as a function of basal diameter (B_D, mm).
Source of data:	SB Ghezei, JG Annandale and CD Everson, Shoot allometry of *Jatropha curcas*, *Southern Forests,*2009
Value applied:	$$fj(B_D) = \frac{a \cdot B_D{}^{b}}{10^6}$$ $$a \approx 2.83 \cdot 10^{-4}$$ $$b \approx 3.529$$
Justification of choice of data or description of measurement methods and procedures applied:	Since this allometric equation is not site specific, the equation used is extract from published peer-reviewed studies.
Any comment:	

Data Unit / Parameter:	R_j
Data unit:	kgd.m. (kgd.m.)$^{-1}$
Description:	Root-shoot ratio appropriate for biomass stock, for *Jatropha curcas*
Source of data:	A default IPCC value
Value applied:	0.3kg d.m. (kgd.m.)$^{-1}$
Justification of choice of data or description of measurement methods and procedures applied:	As per applied methodology
Any comment:	

Data Unit / Parameter:	$t_{equilibrium}$
Data unit:	yr
Description:	Time until a new equilibrium in carbon stocks in soil organic matter is reached for the second agroforestry system in stratum *i,* years
Source of data:	AR-AMS0004 version 2
Value applied:	20 years
Justification of choice of data or description of measurement methods and procedures applied:	As per applied methodology
Any comment:	

Data Unit / Parameter:	$\Delta C_{agroforestry,i}$
Data unit:	t C yr^{-1}
Description:	Average annual change in carbon stock in soil organic matter for stratum *i*, for year *t*
Source of data:	AR-AMS0004 version 2
Value applied:	A default value of 0.5 tC ha^{-1} yr^{-1} shall be used
Justification of choice of data or description of measurement methods and procedures applied:	As per applied methodology
Any comment:	

4.2 Data and Parameters Monitored

Data Unit / Parameter:	B_D
Data unit:	cm
Description:	Basal diameter of trees in permanent sample plots
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	Basal perimeter of all the trees in the permanent sample plots will be measured
Frequency of monitoring/recording:	Before any verification event

Value applied:	<table><tr><th>Age of the plant (years)</th><th>B_D (cm)</th></tr><tr><td>**0**</td><td>0,8</td></tr><tr><td>**1**</td><td>3,0</td></tr><tr><td>**2**</td><td>8,6</td></tr><tr><td>**3**</td><td>15,3</td></tr><tr><td>**4**</td><td>18,7</td></tr><tr><td>**5**</td><td>19,7</td></tr><tr><td>**6**</td><td>19,9</td></tr><tr><td>**7**</td><td>20,0</td></tr><tr><td>**8**</td><td>20,0</td></tr><tr><td>**9**</td><td>20,0</td></tr><tr><td>**10**</td><td>20,0</td></tr></table>
Monitoring equipment:	Reel tape measure
QA/QC procedures to be applied:	10% of permanent sample plots shall be randomly selected and basal diameter re-measured independently
Calculation method:	Basal diameter will be calclated out the measured perimeter which can be considered as a circle
Any comment:	

Data Unit / Parameter:	A_i
Data unit:	ha
Description:	Area of stratum i
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	Georeferencing of each plot of the stratum using GPS and part of the GIS
Frequency of monitoring/recording:	At the start of the project activity and a sample of 2% of the total area of stratum every year is carried out
Value applied:	
Monitoring equipment:	GPS
QA/QC procedures to be applied:	A sample of 10% of the sample plots monitored every year shall be randomly selected and verified
Calculation method:	Addition of all the surfaces of the plantation plots of the stratum
Any comment:	

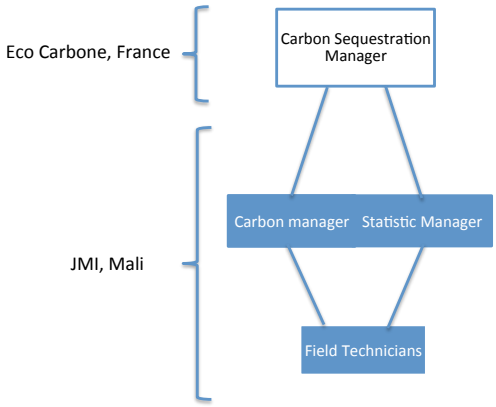
Data Unit / Parameter:	$A_{sp,i}$
Data unit:	ha
Description:	Total area of all the permanent sample plots in stratum i
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	Georeferencing of each sample plot of the stratum using GPS

Frequency of monitoring/recording:	At the start of the project activity and every five years since the initial verification and certification of an A/R project activity under the CDM.
Value applied:	
Monitoring equipment:	GPS to locate the plot and then a graduated meter tape
QA/QC procedures to be applied:	10% of the permanent sample plots shall be randomly selected and re-measured independently
Calculation method:	Multiplication of permanent sample plot size by the number of permanent sample plots in the stratum
Any comment:	

4.3 Description of the Monitoring Plan

The monitoring plan is based on stratification and sampling design. This is due to the scale of the project activity and its core structure. The monitoring plan is developed with a targeted precision level of ±10 per cent of the mean at 90 per cent confidence level. JMI and Eco Carbone have developed a procedure regarding the monitoring plan : “La procedure de suivi carbone”.

4.3.1 Monitoring team



Monitoring team

Eco Carbone, France, through the Carbon Sequestration Manager, will be in charge of the global monitoring coordination and will have the following tasks:

- Elaborate the protocols for field measurements in accordance with the Monitoring Plan
- Train local team of JMI employed for the monitoring activities regarding the protocols for field measurements
- Analyze the data entered by JMI in the GIS and the database
- Apply the QC/QA procedure regarding the field measurements and data entry by JMI
- Elaborate the monitoring report

JMI, with the Statistic manager and the Carbon manager, will be in charge of the local monitoring coordination and will have the following tasks:

- Apply protocols for field measurements
- Train Field technicians employed for the monitoring activities regarding the protocols for field measurements
- Enter data in the GIS and the database for further analysis by Eco Carbone and JMI
- Apply the QC/QA procedure regarding the field measurements and data entry

JMI, with the field technicians, will be in charge of the parameters to measure and will have the following tasks:

- Measure the parameters accordingly to protocols for field measurements
- Complete spreadsheet with the measures performed in order for the statistic manager to enter these measures into the database and the GIS
- Apply the QC/QA procedure regarding the field measurements

Additional external expertise may be used for QC/QA issues. The external expertise will rely on research institutes, private companies, and independent experts specialized in social and environmental assessment, reforestation and carbon issues.

4.3.2 The project boundary

4.3.2.1 Monitoring the grouped project area

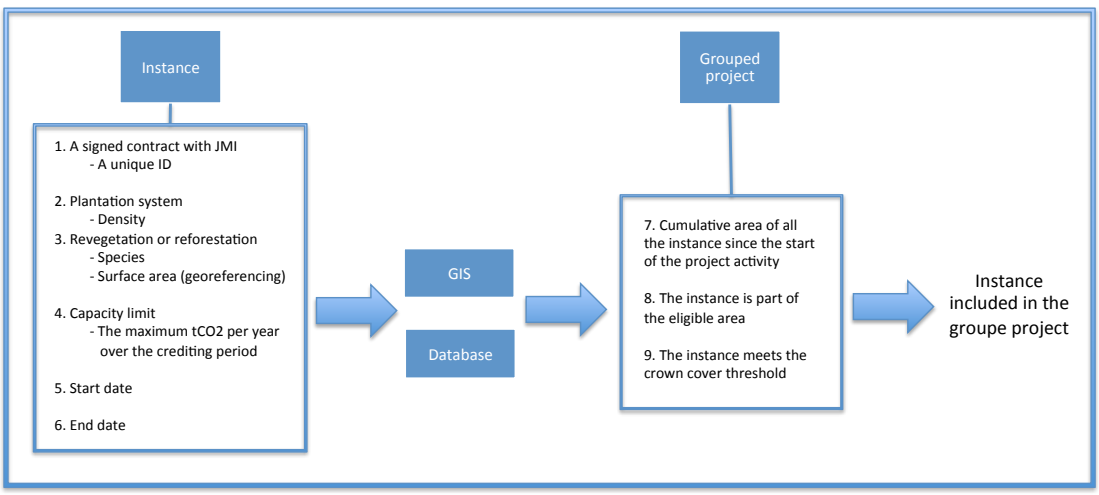
This is meant to demonstrate that the actual area under revegetation or reforestation conforms to the area outlined in the PD. The following activities are foreseen:

- Measure of geographical position (latitude and longitude of each corner polygon sites) by GPS in order to confirm project and strata boundaries
- Measures by GPS of every plot

Data will be part of the GIS system. SOPs for those activities are detailed in “la procédure de suivi carbone” and “le guide de géo référencement”

4.3.2.2 Monitoring the inclusion of instances

Any instance included in the grouped project follows the inclusion process developed by JMI :



Inclusion of instances into the grouped project

The inclusion of an instance into the grouped project leads to the assignment of a unique ID. This identification enables JMI to follow up all the instances at the grouped project level through the GIS and the Database.

The unique ID prevents double counting that could occur with several instances with non-unique ID codes. Any carbon credits claimed for an instance refers in the database to a unique ID for a given period and a given amount of carbon removed

4.3.3 Monitoring plan

4.3.3.1 Stratification ex-post

Each instance of the grouped project is part of a stratum. Stratification are to be designed with :

1. The year of plantation
2. The plantation system

Plantation systems are related to density. The 3x3 system is 1100 trees/ha as well as the 2_1x8 system but trees are planted in narrow strips with larger interspaces.

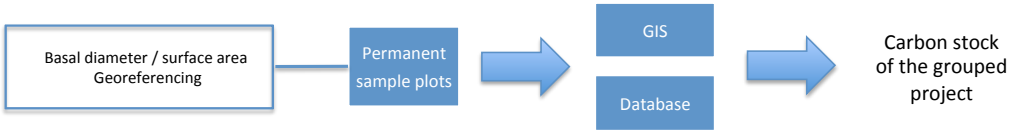
Strata	2007.3x3	2008.3x3	2009.3x3	2010.3x3	2011.3x3	2011.2_1x8
Surface area (ha)	50	100	300	700	300	600

This may change in case of unexpected disturbance (e.g fire, pests or disease) or if new stratum merges from existing strata with similar behavior in terms of carbon sequestration. When observed, the change of project boundary will be recorded using GPS and entered in the project GIS.

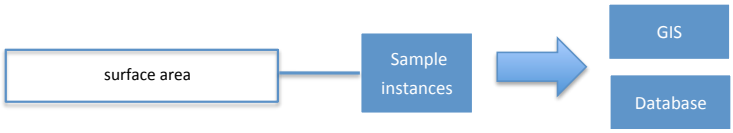
4.3.3.2 Sampling

The sampling design will be implemented using the CDM A/R methodological tool *"Calculation of the number of sample plots for measurements within A/R CDM project activities"* in its latest version. This tool gives the number of samples to perform on the project boundary. This number of samples is applied to the permanent sample plot:

- Permanent sample plots are used to measure basal diameters in order to estimate the carbon stock across the time. A unique code is assigned to every permanent sample plot and a georeferencing is performed. Once the carbon stock is calculated for the sample plots, it is extended at the surface area of the corresponding strata. All the carbon stocks in strata enable to have the overall carbon stock at the grouped project level.



- Sample of instances are used to perform checks on the grouped project boundary



The two types of samples are designed, explained and implemented according to “la procedure de suivi carbone”. JMI and Eco carbone have developed this document to set out the rules and how the monitoring will be achieved at every level.

4.3.4 Quality Assurance and Quality Control (QA/QC)

Quality Control (QC) is a system of routine technical activities, to measure and control the quality of the monitoring as it is being developed.

4.3.4.1 Reliable field measurements

Collecting reliable field measurement data is an important step in the quality assurance plan. Persons involved in the field measurement work should be fully trained in the field data collection and data analyses. Standard Operating Procedures (SOPs) for each step of the field measurements shall be developed and adhered to at all times. These SOPs should detail all phases of the field measurements and contain provisions for documentation for verification purposes, so that measurements are comparable over time and can be checked and repeated in a consistent fashion. To ensure the collection of reliable field data,

- Field-team members shall be fully aware of procedures in which they are involved and the importance of collecting data as accurately as possible;
- Field teams shall install test plots if needed in the field and measure all pertinent components using the SOPs;
- Field measurements shall be checked by a qualified person to correct any errors in techniques;
- Any new staff is adequately trained.

4.3.4.2 Verification of field data collection

A minimum of a 4 PDOP is required when GPS localization is undertaken, If this is not the case measures need to be made at another time. Checks are made once the statistic manager exports GPS data. 10% of the sample instances shall be randomly selected and geo-referencing shall be undertaken in order to verify the project boundary.

- Any deviation between measurement and re-measurement below 10% will be considered acceptable
- Any error above 10% shall be dealt in a consistent manner :
  - Any errors discovered should be expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error. The Statistic Manager shall provide a sound and rational explanation otherwise the Technical Director shall be consulted on this issue in order to provide reasonable solution and to consider the minimum surface measured.

To verify that plots have been installed and the measurements taken correctly, a sample of 10% of the permanent sample plots shall be randomly selected and re-measured. Key re-measurement elements include the location of plots, the surface area and the basal diameters. The re-measurement data shall be compared with the original measurement data.

- Any deviation between measurement and re-measurement below 10% will be considered acceptable
- Any error above 10% shall be dealt in a consistent manner :
  - Any errors discovered should be expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error. The Statistic Manager shall provide a sound and rational explanation otherwise the Technical Director shall be consulted on this issue in order to provide reasonable solution or to replace the plot.

4.3.4.3 Verification of data entry and analysis

Reliable estimation of carbon stock in pools requires proper entry of data into the data analyses spreadsheets.

- A first check shall be made by the statistic manager: checking data entered in GPS, geolocalization, area planted.
- A second check shall be made by the carbon manager to prevent any omission or mistakes while randomly picking data.
- A third and last check shall be made by the carbon sequestration manager at Eco Carbone to ensure the consistency of the information.

Verifications of data will be further detailed in “La procedure de suivi carbone”. This document aims to track and detail all the procedures applied for this proposed grouped project.

4.3.4.4 Data maintenance and archiving

Because of the long-term nature of the project activity, data shall be archived and maintained safely. Data archiving shall take either electronic or paper forms, and copies of all data shall be provided to Eco Carbone, JMI. This archiving will be kept until 2 years after the end of the crediting period. All electronic data and reports shall also be copied on durable media such as CDs or copies of the CDs are stored in multiple locations. The archives shall include:

- Copies of all original field measurement data, laboratory data, data analysis;
- Estimates of the carbon stock changes in all pools and corresponding calculation spreadsheets;
- GIS and database;
- Copies of the measuring and monitoring reports.
- Distant synchronization of electronic data with Eco-Carbone

5 ENVIRONMENTAL IMPACT

Despite the fact that Malian legislation does not require EIA for this project activity, a field study has been conducted over the plantation sites. The analysis of the environmental impacts is detailed in the study attached to the PDD (Social and environmental impacts study):

***Projet de Plantation de Jatropha : Etude d'Impact Environnemental et Social*, Harouna COULIBALY, 2007.**

The main results of this study are summarized:

The regions concerned by the MJCPP are mainly covered with scattered shrubs and grassland where little husbandry and no forest can be found. As many other areas in Mali, the proposed project area consists of land that has fallen victim to deforestation and severe degradation. According to FAO forest statistics[41], 500,000 ha of dry natural forests have been cleared between 2000 and 2005. Regeneration capacity is hampered because of excess cutting, livestock grazing and bush fire. As a result, the proposed plantation areas are depleted to such an extent that they are no longer fit for economic activity, to the detriment of local communities. In addition to carbon uptake, this project will combat desertification.
At this stage, the project area is no longer "threatened" as such, since it has already been completely degraded by human and animal activity. With little or no existing biomass, neither overgrazing, wildfires, nor human economic activity are a real possibility.

The MJCPP will have the following environmental impacts:

- Erosion control (through both improved agriculture and trees). Indeed, the deep root system of Jatrophas is known to stabilize the soil.
- Shade and windbreaks for crop land
- Improved soil fertility from sustainable agriculture, thanks to the life cycle of Jatropha whose falling leaves will fertilize the soil.
- Natural habitats for bees, birds, small animals
- Restored biodiversity
- Improved beauty of the landscape

Identified risks include fire and trampling by animals. The safeguards put in place will be safeguarding and a non-cultivated buffer zone surrounding the plantations to prevent fire. In order to ensure the adequacy of these safeguards, local communities will provide safekeepers to patrol these plantations.

One of the major environmental benefits of the project will be the gradual regeneration of the soil by the Jatropha plantations. This should further improve the productivity of the selected Jatropha species in the future. In addition, due to the training and know-how provided by JMI, as well as the guarantee of JMI to purchase Jatropha seeds, there will be a financial interest on the part of local communities to continue with their plantations, rather than converting the land for other purposes.

This project will be particularly important as a catalyst, because it will establish an extensive network of know-how (on the part of local communities as well as JMI) and infrastructure to manage the plantations (particularly the nurseries). These efforts will be more easily replicated elsewhere once the project has proven successful. As local communities become more experienced with the plantations, they will certainly wish to expand their reforestation efforts. Similarly, a number of other private companies are likely to get involved in both plantation and tree nurseries.

[41] Jatropha.fao.org/forestry/site/32185/en/mli

6 STAKEHOLDER COMMENTS

Two public stakeholder meetings have been held according to the article 17 of the decree "N° 03-594/P-RM"[42] (31 december 2003). Stakeholders were informed either through personal invitations or a post in the local newspaper. Rural Communities expressed strong interest in participating in the proposed ARR project activity in view of obtaining the following benefits:

- Employment will be created close to communities' villages, thereby making it possible to look after cropland at the same time. Increased income from selling Jatropha seeds as well as CER revenue.
- Environmental protection: Jatropha plantations will improve the local environment, shelter cropland and reduce the effects of drought, flood and other natural disasters.
- Education: transfer of good practices for tree planting, Jatropha seeds production and forest management.

In Kita (11 June 2007), the following persons have attended the public meeting:

Monsieur Samankou Kéita Promoteur et Président de l'ONG NEDEC Kita ;
Monsieur Sinè COULIBALY, Secrétaire NEDEC Kita ;
Monsieur Fodé DEMBELE, Co-promoteur de NEDEC Kita;
Monsieur Modibo Kéita, Conseiller au Maire de la commune de Kita Ouest ;
Monsieur Sékou Boucounta Cissoko, Planteur de Jatroha à Tabacofè
Monsieur Famakan Cissoko, Planteur de Jatroha à Tabacofè
Monsieur Bouacar Cissoko, Planteur de Jatroha à Tabacofè
Monsieur Soundjè Kéita, Conseiller au Maire de la commune de Djidian ;
Monsieur Moussa Fodé Cissoko, Chef du Service de la Conservation de la Nature Kita ;
Monsieur Lamine Kéita, Conseiller au Maire de la commune de Kita Nord ;
Monsieur Samou, Planteur de Jatroha à Siranikoto
Monsieur Nama Cissoko, Planteur de Jatroha à Siranikoto
Monsieur Badra Alou Cissoko, Planteur de Jatroha à Siranikoto
Monsieur Famougouri Cissoko, Animateur du projet Jatropha Kita.

In Sirakorola (18 June 2007), the following persons have attended the public meeting:

Monsieur Bakary KONE, Animateur Eco-carbone de Koulikoro ;
Monsieur Hamidou YORO, Animateur Eco-carbone de Koulikoro ;
Monsieur le représentant du maire, Conseiller au Maire de la commune de Sirakorola ;
Monsieur Yaya TRAORE, Planteur de Jatroha à Sirakorola
Monsieur Djibi BOLY, Planteur de Jatroha à Sirakorola
Monsieur Zoumana GUINDO, Planteur de Jatroha à Sirakorola
Monsieur Amadou TRAORE, Planteur de Jatroha à Fansébougou
Monsieur Sery TRAORE, Planteur de Jatropha Monzombala
Monsieur Soro TRAORE, Planteur de Jatropha Monzombala
Monsieur Mahamane MAIGA, Service de la Conservation de la Nature
Monsieur Cheickna COULIBALY, Chef Secteur Agriculture
Monsieur Oumar SAMAKE, Chef du Centre d'Animation Rurale

Local stakeholders think that the project is in accordance with the country development main strategic orientations. They believe that the project will contribute to poverty reduction and will decrease youth unemployment. They also say that the project has a positive impact on reforestation of cultivated ecosystems and on the degraded soils physical and chemical restoration.

[42] http://Jatropha.sante.gov.ml/index.php?option=com_content&task=view&id=325&Itemid=87