Project design document form (afforestation or reforestation)

(Version 10.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Kachung Forest Project: Afforestation on Degraded Lands
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	09 dated 28/01/2019
Completion date of the PDD	28.01. 2019
Project participants	• Busoga Forestry Co. Ltd • Green Resources AS
Host Party	The Republic of Uganda
Applied methodologies and standardized baselines	Approved afforestation and reforestation baseline and monitoring methodology AR-AM0004, "Reforestation or afforestation of land currently under agricultural use" version 4.
Estimated amount of annual average net anthropogenic GHG removals	27,427

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>> The proposed A/R CDM project activity of Kachung Forest Project (KFP) described in this document is implemented on land within the Kachung Central Forest Reserve (hereafter "the Reserve") in the administrative district of Dokolo, Northern Uganda. The project activity will establish and manage exotic and indigenous afforestation on approximately 2,099 ha of degraded grass and shrubland.

Overall objective of proposed A/R CDM project activity

The overall objective of the A/R CDM activity is to contribute to mitigating climate change while meeting the growing demand for quality wood products from well managed plantation forests and contributing to sustainable environmental management, community development and poverty alleviation in Uganda.

Specific objectives of the proposed A/R CDM project activity:

1) To establish and manage forest plantations to meet the growing demand for high quality wood products. With an annual loss of 2.2 percent in forest area, Uganda was among the ten countries globally with the highest deforestation rates between 2000 and 2005. Uganda has to expand its wood resources substantially to meet the growing demand of wood products and to reduce the strong pressure on the remaining natural forests. The implementation of the proposed A/R CDM project activity will therefore benefit the forestry sector through an increase in the timber supply, management and overall sustainability of national resource base, and alleviating pressure on the country's natural forest.

2) To sequester carbon dioxide through forest planting, generating high quality emission reductions in greenhouse gases (GHG) that can be measured, monitored and verified. The project participants strive to demonstrate that carbon sequestration from forest plantations is a viable instrument to encourage private investment in the forestry sector, especially on degraded lands.

3) To promote environmental conservation such as soil conservation, protection of water sources and enhancement of biodiversity through the protection and management of existing indigenous flora and fauna and where possible enrichment planting with indigenous tree species.

4) To facilitate socio-economic development of the local communities through:

   - Promotion of tree planting/afforestation activities in the local communities;
   - Provision of employment opportunities;
   - Support for development initiatives for the communities through the sale of carbon credits;
   - Establishing of community woodlots in the villages around KFP on community owned land, with the objective of increasing fuel and timber supply within the communities;
   - Designating 10% of the carbon revenues generated by the project to community development initiatives in the villages surrounding KFP;

5) To develop local infrastructure including roads, health centers, water supply and communication systems.

The species to be planted are *Pinus caribaea, Eucalyptus grandis, Eucalyptus camaldulensis, Eucalyptus clones (grandis* and *camaldulensis (GC) hybrids) and Maesopsis emiini*. Other species are also being planted for trial, enrichment planting and research purposes, such as *Tectona grandis, Markhamia lutea, Vitellaria pradoxa and Gmelina arborea* trees. The carbon benefits of these trials will not be included in the carbon estimates, and thus are not included within the A/R CDM project (see map shown in A.2.2.1 for location of experimental plots). All species have been screened against the global database of invasive species and are not invasive in Uganda.

Table A.1.1: Species to be planted in the A/R CDM project:

No.	Species selected	Type	Uses
1	*Pinus caribaea*	Exotic softwood	Timber
2	*Eucalyptus grandis*	Exotic hardwood	Poles, timber
3	*Eucalyptus camaldulensis*	Exotic hardwood	Poles, timber
4	*Eucalyptus clones (GC)*	Exotic hardwood	Poles, timber
5	*Maesopsis eminii*	Indigenous hardwood	Timber

Table A.1.2: Scheduled plantable areas 2007 – 2011

Year of planting	***Pinus Caribaea* (Ha)**	***Eucalyptus grandis, camaldulensis and clones* (Ha)**	***Maesopsis eminii* (Ha)**	**Total (Ha)**
2006	16.0	31.1	-	47.1
2007	138.9	-	-	138.9
2008	254.8	64.5	-	319.3
2009	396.7	25.4	9.6	431.7
2010	498.8	105.2	87.5	691.5
2011	257.6	89.9	122.9	470.4
Total	**1,562.8**	**316.1**	**220.0**	**2,098.9**

Table A.1.3: CDM planted areas in hectares (ha) from 2006 to 2014

Species	***Eucalyptus clones (ha)***	***Eucalyptus grandis(ha)***	***Pinus caribaea(ha)***	***Pinus Oocarpa(ha)***	**Total*(ha)***
2006	-	9.5	15.7	-	25.2
2007	-	-	115.1	8.5	123.5
2008	-	48.9	227.9	-	276.8
2009	-	-	292.8	-	292.8
2010	28.1	-	617.7	-	645.8
2011	35.1	-	292.8	-	328
2012	25.5	-	123.1	-	148.6
2013	30	-	50.5	-	80.6
2014	-	-	3.8	-	3.8
Grand Total	118.7	58.4	1739.6	8.5	1925.2

Changes in species composition

The PP planted more area of Pine than is stated on the PDD and less of Eucalyptus and Maesopsis, leading to a change in the species composition (see table A.1.3 above). Pine represents 91% of forest cover for KFP instead of 74%, Eucalyptus 9% instead of 15% and Maesopsis 0.0 % instead of 10% due to its failure in 2010 with no surviving stands in 2017. This area was replanted with Pinus caribaea. Under the Guideline from EB 66 Annex 24 the PPs must demonstrate that such a change would not affect the additionality of the project. Considering that this change means a larger area of pine has been planted, and that pine has a longer rotation than eucalyptus, there's a larger part of the project investment with a longer period of return (the age until clear fell for eucalyptus is ~10 years and pine is ~20 years). Therefore, the IRR of the project carbon finance is even more important, and thus, a stronger case regarding additionality. The planting in 2013 and 2014 is mainly replanting of failed eucalyptus stands.

The planting schedule will be repeated following harvesting at 10, 20 and 22 years for Eucalyptus, Maesopsis and Pine, respectively.

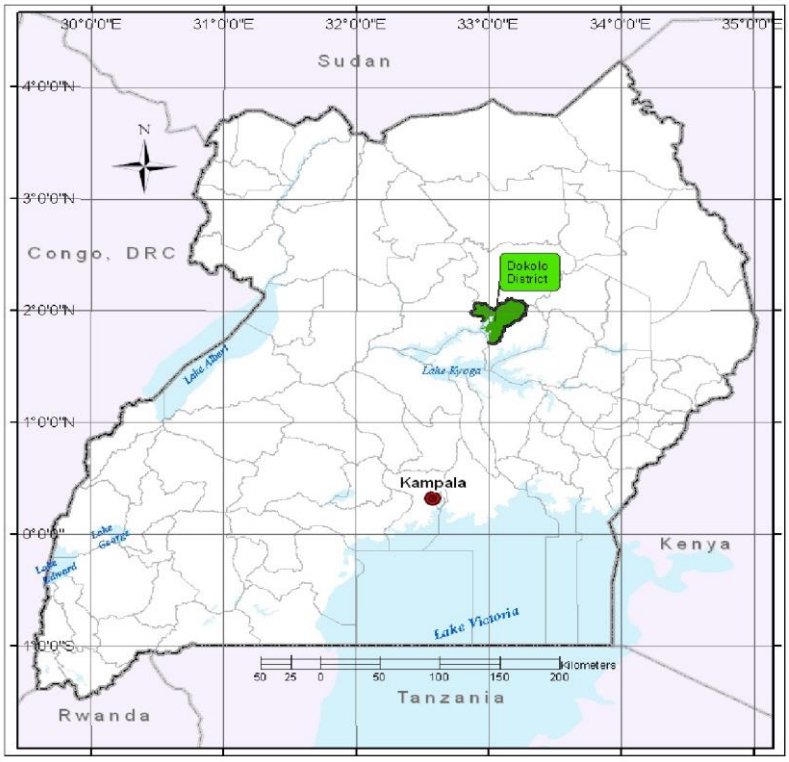
The land license for KFP is for 2,669 ha of which approximately 2,099 ha is eligible for reforestation under the CDM. Lango Forestry Co. Ltd (LFC), formerly known as the Norwegian Afforestation Group (NAG), and Green Resources AS adheres to all national legislation and regulations as laid out by the Ministry of Water and Environment under the governance of the National Forestry Authority (NFA), which is responsible for forestry activities in Uganda. The remaining land of approximately 600 hectares contains pockets of remnant vegetation and wetland areas, which will be conserved.

A.2. Project boundary

>> A.2.1. Location of the proposed A/R CDM project activity:

The proposed A/R CDM project activity is located in East Africa, in the Republic of Uganda. The specific area of project activity is in the Kachung Central Forest Reserve in the administrative district and county of Dokolo and the sub-county of Agwata.

Figure A.2.1.1 Location of Dokolo district in Uganda



A.2.1.1. Host Party(ies):

The Republic of Uganda

A.2.1.2. Region/State/Province:

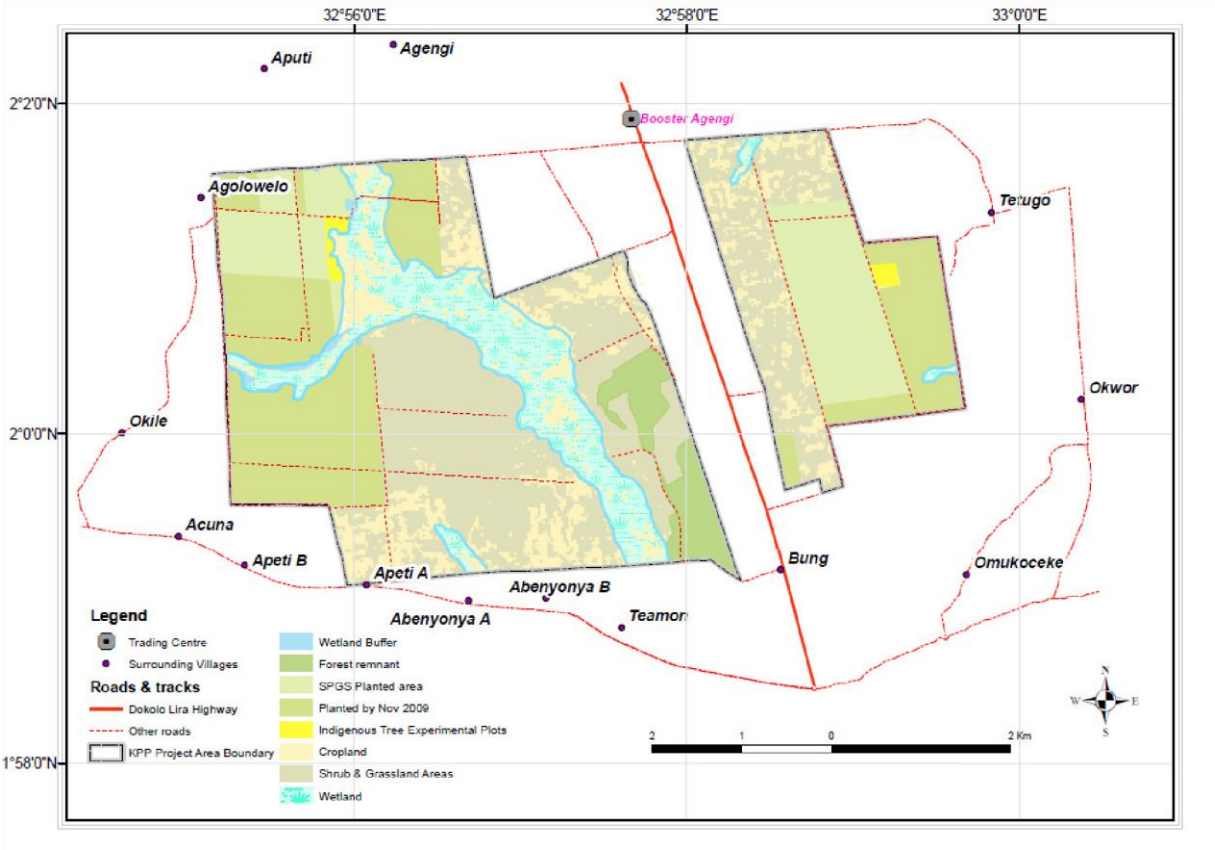
Dokolo District, Northern Uganda

A.2.1.3. City/Town/Community (if applicable):

The area of land to be reforested is located on:

1) Kachung Central Forest Reserve. No settlements are within it, but it is surrounded by fourteen villages located in three parishes: Aputi, Adok and Amuda parish.
2) The project participant's main headquarter is in the town of Lira, PO Box 386

Figure A.2.1.3.1: Map of land-class cover of project area and location of surrounding villages



A.2.2 Detailed geographic delineation of the project boundary, including information allowing the unique identification(s) of the proposed A/R CDM project activity:

The project boundary, geographical location and polygons of the discrete land parcels of the CDM A/R project activity are indicated below. The specific geographical coordinates/ positions (longitude, latitude) of the polygons were determined using GIS, taking a central point, and are shown in Table A.2.1.4.

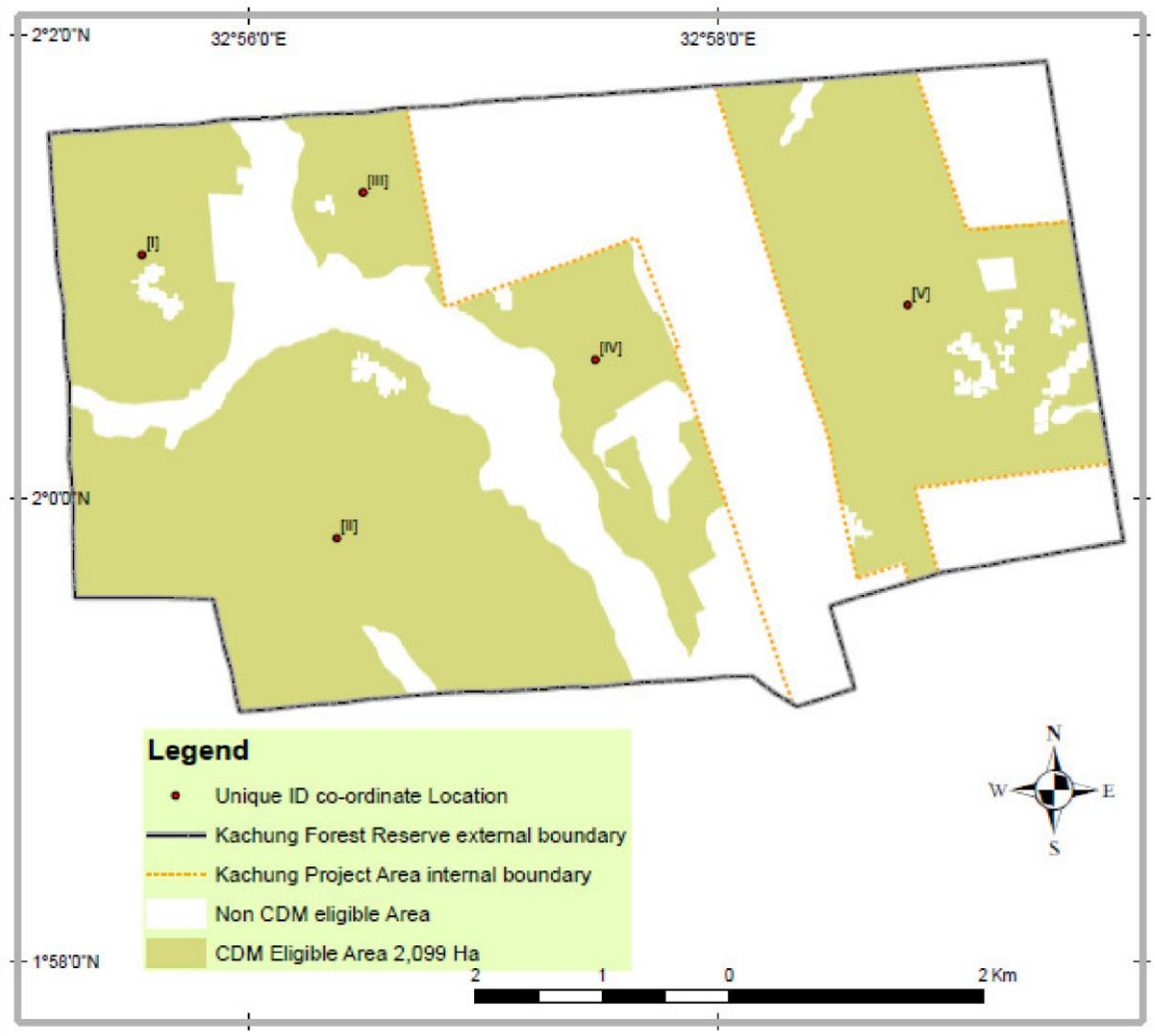
The project boundary area of land is 2,099 ha confined within 3,500 ha of Reserve land, located between 1° 58' 56" N to 2° 2' 32" N and 32° 54' 55" E to 32° 59' 43" E.

Table A.2.1.4: Unique identification of the polygons for the KFP

CDM Block ID	Area (ha)	Grid coordinates (UTM)	
		Eastings	Northings
I	275.2	491,742	222,989
II	815.5	493,280	220,742
III	121.9	493,490	223,484
IV	228.1	495,325	222,157
V	658.2	497,792	222,592

Buffers around wetlands will not be planted and are thus excluded from the CDM eligible area, as shown by the map in figure A.4.3 below.

Figure A.2.2.1: Map of the Kachung Plantation Project area showing CDM and Non-CDM eligible areas



A.3. Legal title to land

>> The Reserve, and thus the project area, is formally owned by the government under Article 237 (2) (b) of the Constitution of the Republic of Uganda. LFC acquired a land license/ permit No. 4230 from the Forest Department on 15/11/1999, which is title granting a 50 year-contract for land development through tree planting in the Kachung Central Forest Reserve. Although a limited contract of 50 years is in place, the land license can be renewed, offering the potential of even longer-term project activities.

Rights to tCERs

The Ministry of Water Lands and Environment is yet to formally include carbon rights with respect to A/R projects and so there is no Ugandan Law explicitly stipulating ownership rights. It is, however, recognised by the Ministry of Water Lands and Environment that benefits in the form of carbon credits from forests are owned by the title holder of the land, which in this case would be LFC.

A.4. Eligibility of land

>> Project participants demonstrate that the land within the project boundary is eligible for an A/R CDM project activity by following the steps outlined in the 'Procedures to define the eligibility of lands for afforestation and reforestation CDM project activities, version 1'.

(a) The land is not forest at the moment the project starts:

i. *The land is below the forest national thresholds (crown cover, tree height and minimum land area) for forest definition under decisions under decisions 11/CP.7 and 19/CP.9 as communicated by the respective DNA;*

The procedure to demonstrate eligibility of land requires that the lands or discrete areas of land to be forested must meet the definition of forest by the host country under decisions 11/CP.7 and 19/CP.9 as communicated by the respective DNA. At the time of preparing the PDD, the Climate Change Secretariat (DNA) for Uganda has defined and communicated the national forest thresholds as land which has:

- Minimum area of 1 hectare
- Minimum tree crown cover of 30 %; and • A minimum height of 5 meters at maturity.

The assessment of land eligibility of the parcels of land under the proposed project activity is based on the above definition.

The CDM project area consists of grass and shrubland with scattered trees, and cropland areas. The plantable areas delineated on the basis of the above definitions are 'shrub and grasslands' and 'cropland', shown in figure A.4.1, and both of which fall well below the national forest definition. The land eligibility is herein demonstrated using Landsat imagery of 1989, NFA maps from 2005, and GPS field based mapping undertaken to create a 2009 baseline map demonstrating land-class over the titled land to LFC.

The maps are presented in figures A.4.1, and reflect the land cover maps of 1989, 2005 and 2009. The pre-1990 (1989) Landsat classification indicates that there were some forest remnants in the reserve at this time, although these areas have been excluded from the A/R CDM project following the A/R CDM 1990 rule.

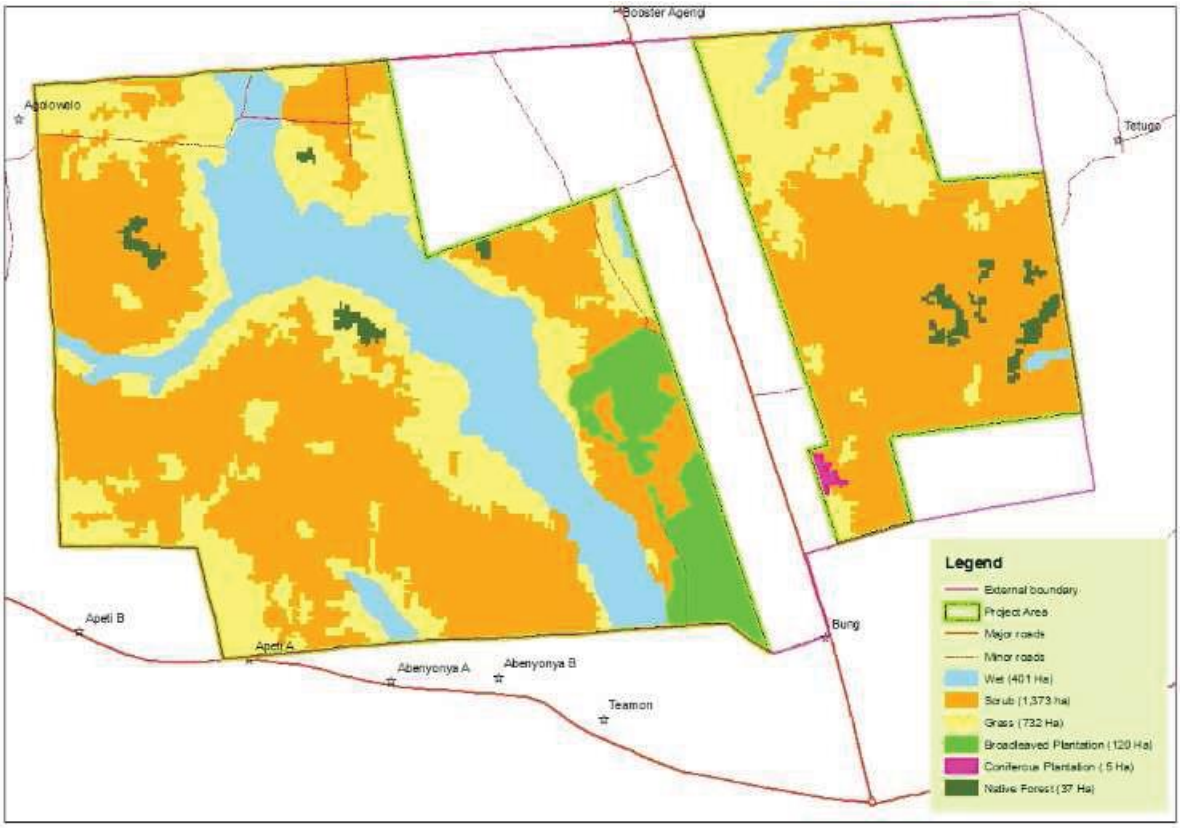
The government map created by the NFA in 1995 shows that the majority of the project area was classified as "woodland", inline with their woodland definition of: "wooded areas where trees and shrubs are predominant"1. This definition creates a very broad characterization of the land-class, with no specification of the density or height of the trees. The woodland vegetation at KFP in 1995 was not at/ or above the forest definition, as although there is woody vegetation within the reserve, it was at a sparse density, like that of a savanna - as stated by the FAO and according to local community descriptions from the Ecological Survey. The reserve has been of a savanna land-class even before it was initially gazetted2. At this time, the land was used for grazing activities, suggesting an absence of forest due to the prevalence of grass being used as fodder.

The time series from 1995 to 2005, based on the NFA maps, shows how that the land class changed from an area of woodland vegetation to bush (synonymous with shrubland) and subsistence agricultural land. This land-class change clearly demonstrates how the vegetation has been degraded over this time period.

(a) Figure A.4.1: Kachung stratification map of 1989 Landsat image

[1] John Ayongyera, former employee of NFA

[2] FAO, 2009: http://www.fao.org/docrep/n8595e/n8595e05.htm



The project activity is carried out in areas defined as grass and shrubland, and cropland areas. Parcels of remaining forest and wetland vegetation are delineated and excluded as CDM eligible areas and managed for conservation.

ii) The land is not temporarily unstocked as a result of human intervention such as harvesting or natural causes or is not covered by young natural stands or plantations which have yet to reach a crown density or tree height in accordance with national thresholds and which have the potential to revert to forest without human intervention.

Field surveys and locally available information indicate that the discrete areas of land are not temporarily unstocked as a result of human intervention. As demonstrated by figures A.4.1, the land has been degraded through depletion of woody vegetation through fuel-wood collection, charcoal production and to clear land for shifting cultivation and grazing. This has resulted in a degraded state of the land and soils. Furthermore, the presence of grazing in the baseline meant that young seedlings would have little chance of regeneration into a forest.

(b) The project is a reforestation activity:

i. For reforestation project activities, demonstrate that the land was not forest by demonstrating that the conditions outlined under (a) above also applied to the land on 31 December 1989

Through a supervised classification of Landsat imagery from 1989 it can be seen that the land was below that of the Uganda forest definition, and thus was not forest.

A.5. Environmental conditions

>> The proposed A/R CDM project activity is implemented on multiple discrete parcels of relatively uniform characteristics of degraded shrub and grassland with isolated trees, and a smaller stratum of cropland. Pockets of forest are found along part of the wetlands and in a few other small patches of the land being managed by LFC, though these areas are not part of the A/R CDM project. The climate, hydrology, soils, and overall ecosystem characteristics are described below:

A.5.1 Climate:

The average temperature in the Kachung area is 30 °C with an average minimum of 25.5 °C and an absolute maximum of 33.6 °C. The Reserve is located in a high rainfall belt of 1250- 1375mm, with two rainy seasons in March-May and August-October, and dry seasons in December February and briefly in June-July. The rain is usually convectional, occurring later in the day. Wind speed is lower during the rainy season with 1-4 m/sec, compared to 4-8 m/sec in the dry season. With an evaporation of more than 1,800 mm/year, soils retain moisture for short periods during the rainy seasons.

A.5.2 Hydrology:

About 10 percent of Uganda is covered by wetlands, of which about one-third is permanently flooded [3] . The hydrological condition of the project area at KFP is characterised by a wetland which runs through the western block area and which also extends into the project zone by linking up with the larger, broad flood plains to the south and east of the project area (Figure A.2.1.3.1 and B.6.3.1 show the wetlands within the project area and the project zone, respectively).

The wetlands comprise of two seasonal streams (Aminteng and Alwenyi), which will be protected according to the National Environment (Wetlands, Riverbanks and Lakeshore Management) regulations. The SEIA carried out at KFP involved the analysis of samples from each of the streams. The results showed that the early project operations had not negatively impacted the wetlands through chemical contamination; however, bacteriological characteristics of the water sources indicated that agricultural and cattle grazing activities were having a negative impact[4].

A.5.3 Soils:

The topography is a flat plain at an altitude of 1051m to 1082 m above sea leave. The landscape has a low relief and is drained by seasonal streams. The terrain is even, flat and dry.

Dokolo district has two major geological formations characterized by basement complex and
Kyoga series which include phylites, quartzites and pleistocene of resent sediments (NEMA, 1997). The Lango area is covered by deeply weathered soils of low cation exchange capacity virtually devoid of weathered minerals. The soils have good physical properties and their great depth, high permeability and stable microstructure make them less susceptible to soil erosion. The soil's main problem is the poor chemical properties, strong inactivation of phosphorous and deficiency of nitrogen, phosphorous, manganese and zinc, which are very soluble at low pH and often, reach toxic levels (LDPU, 2004).

[3] http://www.fao.org/nr/water/aquastat/countries/uganda/index.stm

[4] Environmental and Socio-Economic Impact Statement Report for the proposed A/R – CDM project activities, Kachung Central Forest Reserve, March 2008

A.5.4 Ecosystems:

The project area is a degraded savanna environment - principally grass and shrubland with herbaceous, shrubs and isolated trees - with the predominant vegetation being *Combretum*, characterized by lush growth of *Hyparrhenia* species. The reserve has been subjected to continued degradation, especially over the last few decades where a significant increase in subsistence activities, such as shifting cultivation and grazing activities, fuel-wood collection, and charcoal production have been witnessed, reducing a denser woodland savannah to a landscape with scarce pockets of trees.

A variety of grass species are present including *Imperata cylindrical, Penicum maximum, Hypererrhenia filipendula, Setaria cephecelata, Setaria megaphylla, Pensetum spp., Afromamum spp., Sporobolus Africana, Eragrostis exasperate, Pasperlum, Parsperlum scrabilatum, Vigna lantiola, Cypress rotenus and bulbosa*. The shrub species that characterize the bushland vegetation are *Albizia Zygia*, *Combretum collinum*, *Borrossus aethiopium Erithrina, abbysinica Grewia molis, Acasia hockii,* and *Bridelia screnura* together with other shrub and tree spp. The grass and herbeous layer consist of *Ceteria megaphylla, Hyperenia phillipendula, Pankam maxima* and *Aphromamum spp*.

The forest area in the southern-central part of the reserve (shown in figure A.2.2.1) is remnants of a former government plantation of broadleaf species, mainly consisting of the exotic species *Gmelina arborea*, which has been seriously degraded over the years. This area is not eligible to be included in the CDM project because it is above the forest definition or Uganda, but will be enhanced as a conservation area through enrichment planting with indigenous species such as shea butter. *Gmelina arborea* trees are seen in other areas of the reserve, having spread from this old government plantation due to the species easy establishing and fast growing species nature. Despite this, even *Gmelina arborea* trees are being degraded at a faster rate than they can establish and grow; however, from a biodiversity perspective, it's important to note that exotic species – even though degrading – were present in the baseline before KFP implementation.

Natural regeneration of forest is prevented by the lack of seed sources, competing grass species which quickly colonize, the significant number of cattle grazing in the baseline and fires regimes used by local communities for charcoal production and to clear land for subsistence agriculture. The consequence of such combined activities is that the land has become degraded and thus reduces the likelihood of any natural regeneration.

Figure A.5.1.1 Vegetation found in the areas planned for A/R CDM project

	
Grassland with pockets of trees and shrubs	Cropland within grass and shrubland
	
Wetland area	Palm trees amongst the grass and shrubland

Special interest sites and areas

Sites of special cultural, ecological, economic or religious significance to the local people have been identified and will be protected and managed as discussed in the ecological survey report.

The various sites of special conservation importance in KFP are presented in Table A.5 and Figure A.5 below:

Table A.5: Existing Sites reported by the community to be of conservation importance

	Resource/Place	**Location (Extra GPS positions)**
1	*Borassus aethiopium* stands	36N 0492853; 0222802;
2	Protected spring	36N 0492503; 0223887;
3	Water point for livestock (Wetland/swamp point 1)	36N 0492 517; 0223890;
4	Cattle way from Apeti village to water source and back point 1	36N 0492395; 0223616;
5	Wetland (swamp) point 2	36N 0492399; 0223532;
6	Wetland (swamp) point 3	36N 0492411; 0223392;

7	Cattle track to water source point 2	036N 0492382; 0223436;
8	Area where guinea fowl were found	36N 0492275; 0223182;
9	Breeding place for hornbill 1	036N 0492267; 0223175;
10	Breeding place for hornbill 2	36N 0492233; 0223095;
11	Sand mining point	36N 0492367; 0223110;
12	Salt lick	36N 0492475; 0222981;
13	Fishing area (Swamp/wetland) point 4	36N 0492853; 0222802;
14	*Vitellaria paradoxa* stands	36N 0494150; 0220864;
15	*Vitellaria paradoxa* stands	36N 0493921; 0222075;
16	Cultural worship place	36N 0493921; 0222075;

Land use and livelihood trends

The land use activities in nearby villages (outside the project boundary) comprise of small scale farming at a subsistence level with livestock grazing a common activity. Originally the communities surrounding the Reserve were practicing shifting cultivation and pastoralism. Despite the reduction in cultivation and pastoralism in the 1980s, in 2002 the current livelihood of 78.9% of the district population depended on subsistence farming[5]. This agriculture is based on the Lango farming system, which relies mainly on human labour and simple hand tools (e.g., hoe, machetes and ox-ploughs). Subsistence crops including pulses (beans, pigeon peas, taper beans, grams, groundnuts), root crops (cassava, sweet potato), cereals (millet, maize, sorghum, rice) and oil seeds (simsim, sunflower) are grown, along with some cash crops such as sunflower, cotton, tobacco and, increasingly, shea butter. Other land use activities practiced by the local communities are fuel-wood collection and charcoal burning. Fuel-wood collection and charcoal production is extremely important to the local communities, providing a means of energy, in particular for cooking.

A.5.2. Description of the presence, if any, of rare and endangered species and their habitats:

The Ecological Survey carried out at KFP indicated that the project area does not have a rich biodiversity due to the continued degradation of the land and increasing human population having out more pressure on the woodland resource. The method followed in the study was two pronged: a consultation with the local communities to hear what flora and fauna they had sighted in and around the project area, and an assessment of flora and fauna through line transects and sample plots. Although the study was carried out in early July 2008, it is deemed sufficient to accurately reflect the biodiversity situation prior to project start in 2006 since only 178 hectares of the project area was planted between the project start and this date, which represents 6.7% of the total area under title, and thus, the majority of the reserve can be assumed to have remained in a similar state to of that in early 2006.

The results from the community consultations show a number of species, both flora and fauna, that locals have reported in and around the project area, and the species' abundance. Results from this component of the study are interesting to gauge past biodiversity in the region; however, it does not accurately reflect that of the project area or necessarily the point of time in question. Many locals may have been drawing on

[5] Uganda Population and Housing Census 2002

recollections from a long time ago and on areas further afield than of that of the project area. These community observations therefore have more significance from the perspective of the "project zone" (the project area and the surrounding areas), but there is still significant uncertainty with regard to timeframes when such observations were made.

Local communities listed the following species as rare and endangered species in the region: plant species including Obia (*Imperata cylindrical*), Itek (*Albizia coriaria*), Odugu (*Combretum collinum*), Aputu (*Pseudso-cedrella kotschyi),* Olilimo (*Ximenia Americana*), Ioro (*Combretum molle*); animals including Aderi (anthlope spp), Amor (duiker), Kul (warthogs); and birds such as Okwir and Iwalu (Crested Crane).

The species that the communities listed (the general lists and the rare, endangered and threatened list) were screened against the IUCN's Redlist[6], nonetheless, to see if any of them were classed as endangered or threatened. The findings show that the species, *Milicia Excelsa*, is classed as "Least Concern" on the Redlist; Duiker species are also classed as "Least Concern", although the "Amor Duiker" is not specifically listed. Any *Milicia Excelsa* found in the project area will be conserved; however, as it was not found in the assessment of the baseline carbon stocks nor the Ecological Survey, it is unlikely that it is within the project area. The Common Duiker's habitat is typically savannah, and as large areas of grassland have been identified outside of the project area, the implementation of the project would not be expected to negatively impact the species.

The field work to assess the project biodiversity found an array of different plant and tree species; however, no animals or birds were recorded from the sample plots, showing that the area has poor fauna biodiversity. All species listed in the field inventory were screened against the IUCN's Redlist and were not listed. They are therefore not classed as rare or endangered.

	
Crested crane	Shea butter tree

[6] http://www.iucnredlist.org/ - a list of species that have been screened and the results have been presented to the
DOE

A.6. Measures

>> *(a) Historical and existing land-use/land-cover changes in the context of the socio-economic conditions prevailing within the boundary of the proposed A/R CDM project activity and key factors that influence the land-use/land-cover changes over time*

As shown in the FAO's Global Forest Resources Assessment 2005, since 1990 Uganda's forests and wooded lands have decreased from approximately 6.3 million to 4.7 million hectares, which presents one of the highest deforestation rates in the world over the last decade[7]. Furthermore, records from NEMA indicate that back in 1890 approximately 10.8 million hectares, equivalent to 45% of Uganda's land area, was forest and woodland[8]. In light of this, it is not surprising that deforestation, or more specifically degradation of savanna woodland, has been present at KFP over the last century, principally due to the prevailing land-use of subsistence agriculture, fuelwood collection, charcoal production and grazing activities. Key policies, regulations and events have acted as precursors to this land-use change and thus driven the extent of the land-cover change.

Contrary to the widespread land-use explained above, some attempts were made by the government to reforest a small part of the reserve in the 1970s using pine species, in particular *Pinus caribea* and *Pinus oocarpa*. The result of this is apparent in the northern-central area of the reserve where the mature plantations can be seen. However, the government was unable to continue with this programme due to financial constraints coupled with the political instability during the following years, which resulted in reforestation attempts ceasing. No attempts of tree planting have been made within the area of the A/R CDM project activity.

Uganda experienced a period of instability during the 1970s with the dictatorship of Idi Amin; a time characterized by political repression, corruption and human rights abuses, and culminating in the Liberation War between Uganda and Tanzania at the end of the decade. Further insecurities proceeded into the early 1980s after the return to power of Milton Obote, which led to an insurgency causing widespread conflict. This era of Uganda's history had strong repercussions for almost all aspects of the country's economy - including the land-use and forestry sector - and meant that people were forced to meet immediate livelihood needs as oppose to long-term needs.

In the early 1970s, the Government of Uganda encouraged the growing of agricultural crops in Central Forest Reserves (CFRs) in a campaign to increase agricultural output. Inevitably this resulted in mass encroachment of CFRs, and successive governments have struggled to reverse this action. This was also the first time that illegal logging by pit-sawing became common practice; another activity which became difficult to control.

Another important factor pertaining to the increased pressure on the land has been the rapid population increase, which almost doubled between 1980 and 2002 (see figure A.6.1.1 below). This vastly increased the demand of food and employment which could not be met by equivalent supply. Such a disparity meant many local communities had no other option but to resort to subsistence living in an unsustainable manner. Thickets and forests became degraded as people exerted them for firewood, charcoal production, timber and clearing virgin land for cultivation and grazing.

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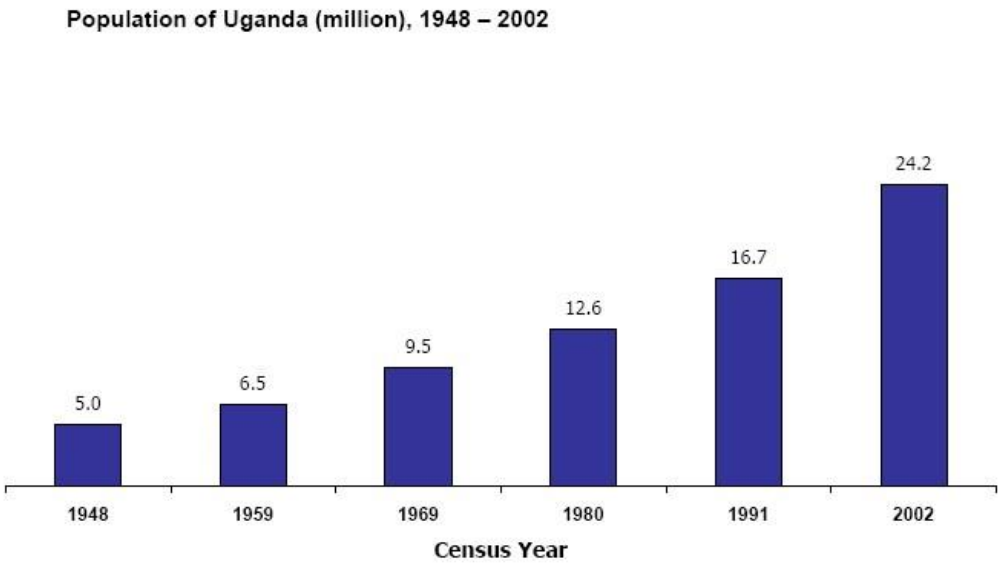
[7] FAO, Global Forest Resources Assessment 2005

[8] Working Paper 3, *natural Resource Management and Policy in Uganda: Overview* Paper, Economic Policy
Research Centre, February 2000,
ftp://ftp.fao.org/agl/agll/kageradocs/08case_studies/ug_nrm_overview_paper.pdf

Figure A.6.1 Uganda population change[9]



Privately owned land has also continued to decrease since the 1980s due to the increasing population, owing to fragmentation and further subdivision among children of the next generation. Further exacerbation of the state of the land occurred when the forest department was taken over by the NFA in 1995. This transitional restructuring led to relaxed enforcement of forest law and regulations, which resulted in an increase of people using the reserve illegally. The reserve was subject to increased anthropogenic pressures compared to adjacent private and community land, the forest reserve has seen far worse anthropogenic pressures to private and community lands, as the clear tenure of individuals' lands means there's no ambiguity for encroachment.

Uganda's economy has developed steadily since 2000, showing how far the country has come since the troubled economic times of the 1970s. It is now one of the fastest growing economies in Africa[10], but, conversely, social indicators still point to an array of problems which are firmly rooted in that of a poor nation: low life expectancy, one of the highest population growth rates in the world etc. Such social problems are prevalent in the communities around the A/R CDM project activity and limit individuals' outlook perspectives to short term needs. Furthermore, the limited availability of jobs in local trading centres and restricted access to loans means that work is hard to find and implementing private initiatives, such as tree planting, is not a viable option currently. The maintenance of a short-term income stream from land use practices which lead to degradation has thus been imperative, even if unsustainable.

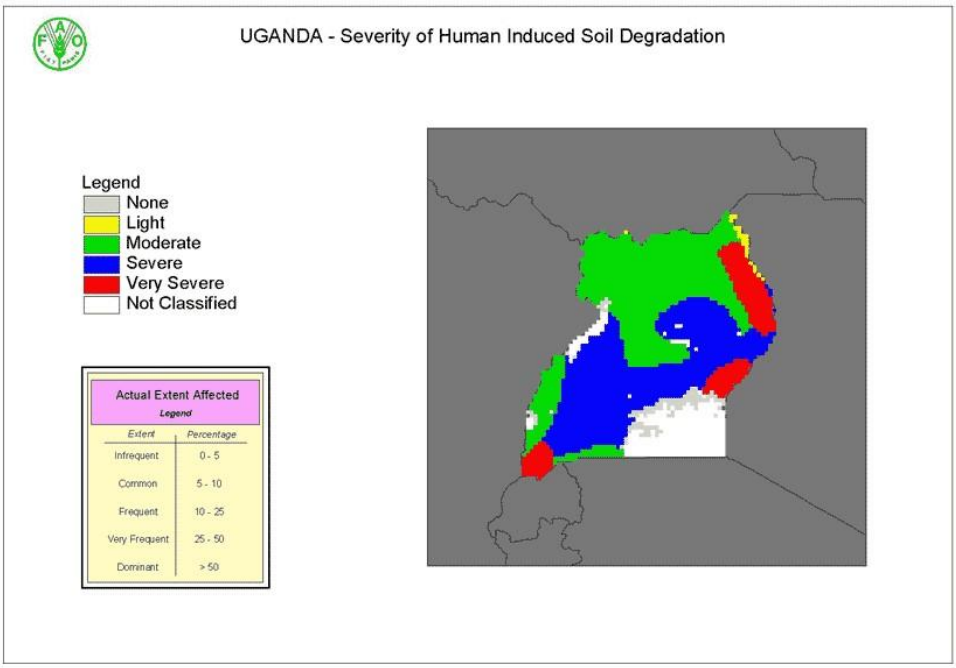
[9] Projections of demographic trends in Uganda 2007-2017, Uganda Bureau of Statistics, December 2007

[10] http://web.worldbank.org viewed 10/11/09

(b) Historical and current land-use/ land-cover change has led to progressive degradation of the land over time including a decrease or steady state at a reduced level of the carbon stocks in the carbon pools

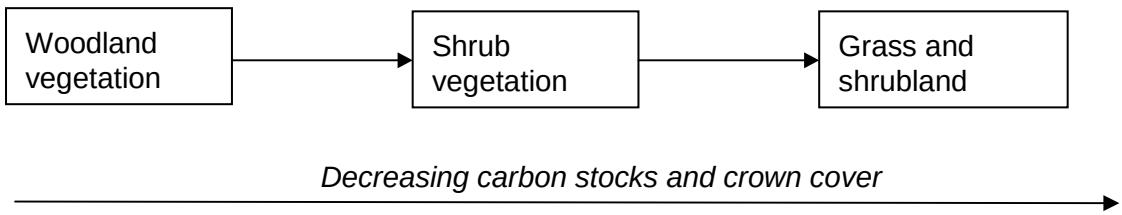
The high prevailing rate of deforestation seen in Uganda over the last century has meant that many areas have been left in a state of degradation. This is highlighted in the work carried out by the FAO to map out the severity of human induced soil degradation (Figure A.6.2), which shows that the majority of Uganda's soils are either moderate or severe in degradation. As indicated by the map, KFP is in an area of severe soil degradation. The results from the Ecological Survey support a problem with the soil, identifying the main concern with them at KFP as being of "poor chemical properties" leading to soil infertility.

Figure A.6.2 Soil degradation map of Uganda[11]



Degradation is also evidenced by comparison of the NFA maps of the reserve from 1995 and 2005, changing from predominantly woodland vegetation below the forest definition to bush vegetation and a significant area of subsistence farmland over this ten year period. Moreover, the current land-use and stratification map that was produced from ground truthing the project area showed that the land was of a grass and shrubland classification.

Figure A.6.3 Schematic of land-class change



[11] FAO (2008) National Soil Degradation Maps http://www.fao.org/landwater/agll/glasod/glasodmaps.jsp?country=UGA&search=Display+map+%21, last updated December 2005

Findings of the Ecological Survey also support the trend of vegetation clearance in the project area, leading to lower crown cover of tree and non-tree vegetation and a more degraded state of the land. Consequently, the carbon stocks in the carbon pools have also been reduced.

(c) National, local and sectoral land-use policies or regulations adopted before 11 November 2001

Local Government Act, 1997:

The Local Government Act was a key policy influencing land-use in Uganda as it effectively devolved management functions from central government to districts and lower-level councils[12].However, district councils took advantage of their new powers of control, which led to exploitation of the forest reserves.

Forest Reserves (Declaration) Order, 1998:

In response to concerns relating to the unsustainable management of the reserves due to the consequences of the Local Government Act, the government introduced the Forest Reserves (Declaration) Order (1998), which reversed decentralization of forest management for forests of 100 ha or more[13].

- Plan for Modernization of Agriculture, 2000:

As part of the Poverty Eradication Action Programme (PEAP, 1997), the Plan for Modernization of Agriculture (PMA, 2000) provides a framework for eradicating poverty through helping subsistence farmers move towards becoming commercial farmers. Forestry is promoted as one such activity, along with agriculture, fisheries and livestock. Though the Plan seems like a positive step towards encouraging sustainable development, the emphasis of the strategy is on key reforms to legal and regulatory frameworks – such as decentralisation to lower levels of local government, removing direct government in commercial aspects of agriculture – and thus assumes the intended reforms will be achievable with just this[14]. In the region of KFP, this policy instrument has not been affective as the local communities have remained without financial resources to develop such activities. Nevertheless, such a credit scheme would be insufficient in establishing a reforestation project due to the large investment costs.

- The National Forestry Policy, March 2001:

As the main policy instrument for forest management in Uganda, it emphasises the importance of protection and sustainable management of Uganda's forests, along with

[12] http://www.fao.org/docrep/005/Y7584E/Y7584E11.htm

[13] Competing jurisdictions: settling land claims in Africa, Sandra Evers, Marja Spierenburg and Harry Wels; can be viewed at:
http://books.google.com/books?id=6iEFRNxiDtIC&pg=PA272&lpg=PA272&dq=The+Forest+Reserves+(Declaration)+Order&source=bl&ots=nKdlCzox6W&sig=I6vQKcy0OegJFFBnNRWEtqatnKw&hl=en&ei=sn7SvD4NYad4Qbp8vDcAw&sa=X&oi=book_result&ct=result&resnum=3&ved=0CA4Q6AEwAg#v=onepage&q=T he%20Forest%20Reserves%20(Declaration)%20Order&f=false

[14] Will the Plan for Modernization of Agriculture Deliver? Samuel Bagabo:
http://www.irdiuganda.org/pdf/pma.pdf

identifying stakeholders that can help promote the development of forestry – including the private sector. However, the policy alone does not have the necessary instruments to develop the forest sector in the desired way, instead it attempts to create a more enabling environment for forestry development.

Other post-11 November 2001 policies/ regulations:

- The National Forest Plan, 2002:

Despite this policy being beyond the time frame of interest as specified in AR-AM0004, it provides evidence that the National Forestry Policy required strengthening to meet its objectives, as it was developed to implement the National Forestry Policy through establishing strategies addressing the policy statements.

- The National Forestry and Tree Planting Act, 2003 (NFTPA)

As the main principle legal instrument for forest management in Uganda, the NFTPA made reforms to accelerate the development of the sector. Key aspects of the Act include: introduction of the National Forestry Authority (NFA) replacing the Forest Department (FD); district forest offices established by district councils; and management and environmental safeguards put in place through requirements of forest management plans and EIAs for projects significantly impacting forests.

The policies adopted before 11 November 2001 do not influence the areas of the A/R CDM project.

(d) Identification of alternative land uses

1. Maintaining the current land-use without the A/R project: The project lands remain as degraded grass and shrubland with increasing shifting cultivation from encroachers. This is the most likely land-use in the absence of the project. Although the encroachment of such activities is illegal according to Ugandan law, the mandatory legal requirements are not enforced by the local government. This is substantiated by the area of cropland which can be seen in the 2005 NFA map.

2. Establishment of government plantations: Talks between the plantation manager and NFA area managers revealed that due to limited government financing, only in 1972 a small share of the Reserve was planted (345 ha) and it is not realistic that there could be a government plantation on any more land due to the financial constraints.

3. Private plantation: Development of an A/R project without the supplementary revenue from CDM would not be feasible due to the low IRR – due to high implementation costs and delayed returns - and substantial risk associated with such an investment in Uganda. The example of a private plantation without CDM certification in the northern central part of the reserve is an exception to this as the private investors were granted a concession right to harvest the standing government plantation on condition that it was replanted. The income stream from harvested timber would have provided significant financial support for replanting and therefore created a much more attractive project. This could not happen in the A/R CDM project area due to the shrub and grassland land-class.

The lack of private sector forest plantations in Uganda is shown in the SPGS report "Forestry Investment in Uganda: Opportunities and Challenges"[15]. The report, produced in 2007, emphasises the expected wood shortfall in Uganda in the coming years due to a lack of plantations to support the increasing demand. The report estimates current plantations in 2007 at 14,000 Ha, of which 70% were under four years old. This means that 9,800 Ha were planted between 2002 and 2006 (it's assumed that the report is not including anything planted in 2007 – this is deemed reasonable due to the study period probably starting a few months before June 2007 and also because any young plantation of just a few months would probably have not have been verified). The report talks about the NFA having "invested heavily in commercial plantations in its first two years but financial constraints have since caused the organisation to cease planting". The NFA was formed in 2003[16], which means that the majority of its planting would have taken place in the following years after this; therefore, a significant amount of the 9,800 Ha of "young" standing plantations referred to in the report would have been done by the NFA.

The NFA website states that a total of 2,132 Ha were established for the financial year of 2004/2005[17]. Assuming that the same area of land was established in the other financial year that the NFA "planted heavily", the total planted area by the organisation would be 4,264 Ha. This means that of the estimated 9,800 Ha planted between 2002 and 2006, approximately 5,500 Ha was not planted by the government, and thus could be attributable to private and NGO/ ODA funded plantations. The rate of non-government plantation establishment for this period can therefore be estimated at 1,375 Ha per year by taking an average. Considering this is a forest plantation rate for the whole country and that some of this would be private smallholders as well as NGO/ ODA development, it is clear that private large scale forest plantations had not been developed at this point in time.

Since 2006 there has been an increasing development in private forest plantations within Uganda due to the incentive of carbon markets. The inclusion of carbon revenues has meant that such projects now offer an attractive enough return for private investment. These are the only significant large scale plantations that are taking place in Uganda.

Below is a list of carbon A/R projects currently being implemented:

Project	**Standard - status**
Nile Basin Reforestation Projects	CDM – registered
Kikonda Forest Reserve	Carbon Fix – registered
Trees for Global Benefits	Plan Vivo - registered

4. Commercial agriculture: The A/R CDM project area being part of a Central Forest Reserve means that only forestry activities can be implemented. Commercial agriculture is therefore not an alternative land use

(e) Demonstrate that land-use/land-cover within the boundary of the proposed A/R CDM project activity would not change and/or lead to further degradation and carbon stock decease in absence of the proposed project activity

[15] Forestry Investment in Uganda: Opportunities and Challenges, A Briefing Note Prepared June 2007 (v.2) by SPGS

[16] http://www.nfa.org.ug/content.php?submenu_id=7

[17] http://www.nfa.org.ug/content.php?submenu_id=4#plant

The plausible scenarios identified in *Step 3* have been evaluated to examine their suitability as the project scenario. The analysis indicated that Scenarios 2, 3 and 4 are not plausible in the near future, principally because of the large investment required and absence of near and significant benefits.

Scenario 1 is the continuation of the existing situation, which is identified as the baseline scenario. A lack of financial resources means that Scenario 2 is unlikely, whilst the financial unattractiveness of the project in the absence of carbon financing would stop scenario 3 going ahead. The implementation the agriculture scenario would not be a legal activity to develop at the site.

The analysis indicates that the plausible alternative land use scenario in the absence of the project activity is the continuation of the current status of the land (shrub-glassland with scattered trees currently under agricultural use).

Step 4: Stratify the A/R CDM project as explained in Section II.3

The A/R CDM project area was stratified as described in Section A.6.

Step 5: Determine the baseline land-use/land-cover scenario for each stratum

The baseline land-use/ land-cover scenario is identified as continuation of the current land-use (baseline approach 22(a)): degradation of grass and shrubland vegetation through subsistence activities including, cultivation, fuel-wood collection, charcoal production and grazing activities. Both strata follow the same baseline, as stated above. The identified baseline means that no natural regeneration is possible to reach the forest definition (see Section A.5).

A.6.2. Description of the identified <u>baseline scenario</u> (separately for each stratum):

As discussed in section A.5 above, there are two strata identified at the project site: grass and shrub land, and cropland. The boundaries of each stratum have been delineated as the plantable areas.

No natural regeneration potential for trees or shrubs is identified within the project activity boundary. This is principally because of the continuous human disturbance whereby areas are cleared for subsistence agriculture (either cropland or grazing) and trees are cut down for fuelwood and charcoal production, which stop trees from regenerating. As such the sum of net carbon stock change in the biomass/carbon pools within the stratum is set as zero.

In addition, the carbon in soil, dead wood and litter is not expected to increase in the baseline compared to the project scenario when the shrub-grassland and cropland strata are planted with trees, as such can be conservatively neglected in monitoring.

A.6.3 Species and varieties selected for the proposed A/R CDM project activity:

Research on the performance of trees suitable for commercial plantations in Uganda is limited with only a small variety of species being well researched. Consequently, this trend has meant that there is a lack of models and silvicultural knowledge resulting in plantation investors having little choice in what tree species to select. Pinus caribea and Eucalyptus grandis are two species well established with successful growth and management information, and were therefore selected on this basis. Maesopsis eminii is a species which has recently been further researched: more advanced yield models have been developed and silvicultural management has been investigated. In light of this development and the

opportunity to diversify the species mix with native timber species, Maesopsis eminii was selected to be planted.

To further the development of suitable tree species for commercial plantations, small compartments of the land that have been granted to LFC are set aside purely for experimental plots (shown in Figure A.4.1. Trials planting Melia Azedarachi, Tectona Grandis, Markamia lutea, Gmelina arborea and Viteralia paradoxa are taking place in these experimental plots and around the nursery operations.

Table A.6.2.1 Trees selected for the proposed A/R CDM project activity

No.	Species selected	Type
1	*Pinus caribaea*	Exotic softwood
2	*Eucalyptus grandis*	Exotic hardwood
3	*Eucalyptus clones*	Exotic hardwood
4	*Maesopsis eminii*	Indigenous hardwood

Table A.6.2.2 Growing conditions of various species to be planted at KFP

Growing conditions	Pine	Eucalyptus	Measopsis
Rain fall, mm	>1000	>1000	1200-3000
Soils	Well drained sandy loams & rocky soils	Deep soils	Deep, moist & sandy loam (wide range site conditions)
Temperature, ºC	20- 37	16-26	22-27[18]
Invasive	No	No	No
Spacing	3m x 3m	3 x 3 m	5m x 5m
Number of stems	1111	1600	400

All species have been screened against the Global Invasives Database and are not invasive. Pine and Eucalyptus have been widely planted for many decades with no invasive characteristics. At KFP, Eucalyptus will continue to be managed in a way that inhibits its uncontrolled spread, hence, will not be invasive. No Genetically Modified Organisms (GMOs) or invasive species will be used.

A.6.3. Technology to be employed by the proposed A/R CDM project activity:

At KFP, modern plantation techniques for forest management and silvicultural practices will be used.

The following standards and all associated requirements will be respected:

1) Forest Stewardship Council's Principles and Criteria
2) SPGS plantation guidelines for Uganda
3) Standard of the "Climate, Community and Biodiversity Alliance" (CCBA)
4) Forest management plan for KFP
5) National Forestry & Tree Planting Act, 2003

[18] http://www.worldagroforestrycentre.org/SEA/Products/AFDbases/AF/asp/SpeciesInfo.asp?SpID=1105

The project cooperates and partners with a number of agencies, institutions and programs for advice pertaining to technical, ecological and social matters, including the National Forest Authority (NFA), The District Land Board, National Environment Management Authority
(NEMA), The Directorate of Water Development (DWD), Makerere University Faculty of Forestry and the Soil Science Department, National Forestry Research Institute (KIFU), Public Health Institute Uganda Timber Growers Association, National Tree Seed Centre, EU Sawlog Production Grant Scheme (SPGS) and local NGOs.

Specific technologies employed during establishment, management, monitoring and verification of the plantation include:

Seed procurement

High quality seeds are obtained from the National Tree Seed Centre (NTSC). The NTSC imports seeds (only from approved sources) or collects them from within Uganda according to NFA guidelines for seedling collection19.

Table A.6.3.1: Seed origin

Species	**Origin/Provenance**
Pinus caribaea	Queensland, Australia, Brazil, and South Africa
Eucalyptus grandis	Uganda, South Africa
Eucalyptus clones	South Africa
Maesopsis eminii	Uganda

Nursery operations

The current nursery of KFP is located at Adok. The nursery covers approximately 1 hectare of land and has the potential to hold up to 1 million seedlings at any given time, of which, *Pinus caribaea* constitute 80 %, *Measopsis* 10% and *Eucalyptus* 10 % of the total number of seedlings. The nursery operations at Kachung Forest Project run from January to December of each year.

Pinus Caribaea seedlings are raised in the nursery starting from May/June and Dec/Jan, for October and May planting, respectively. *Maesopsis eminii* seedlings are raised starting in November and April, while *Eucalyptus*, due to its faster growth rate in the nursery, is only raised from July and February, so as to ensure equal seedling height at time of planting and subsequently a uniform forest stand. The nursery is managed in a way to ensure high quality

[19] For any import, permission has to be sought from the government under Ministry of Agriculture (Department of crop protection). The request has to indicate the seed type, origin and quantity. There after the request can be rejected or accepted and once accepted the order is sent. On arrival in Uganda it is cleared by the agent or by the owner.

seedlings necessary for obtaining a high level of quality tree growth when they are in the field.

The operations that are conducted at the nursery include soil mixing/ sieving, pot filling, preparation of seed and transplant beds, watering, fertilizer application, weeding, root pruning and sanitary activities. Seedlings are raised in polythene tubes and the mixture comprises of 7 parts of forest top soil, 1-part cow manure, 1-part sand and 1-part mycorrhiza. Seedlings are first raised in seed beds prior to pricking out (the process of transferring germinated seedlings from seed bed to polythene tubes and transplanting beds, carried out when seedlings are 2-3 weeks old). The soil used in seedbed is a mixture of different materials similar to that used in the polythene tubes.

Root pruning is carried out as necessary when the seedlings roots grow beyond the polythene tubes. This is the process of cutting lower parts of seedling roots that grow beyond the polythene tube. It is done with the purpose of hardening off and initiating self-establishment of seedlings. This is done when seedlings are about to be transplanted in the field, with the main purpose of hardening off and initiating self-establishment. The seedlings are watered twice a day so as to ensure survival and good growth. Water is easily obtained from a nearby stream using a diesel powered water pump and a large storage tank of 5,000 liter capacity.

Plantation Operations

Plantation operations comprise a number of activities from land preparation to harvesting of the forest products.

Site preparation

Pitting and slashing are the only type of site preparation that takes place. Prior to transplanting, planting spots are marked out in the field where holes of diameter 20-30 cm and depth 30-40 cm are dug at a spacing of 3 x 3 m (pine), 3 x 3 m (eucalyptus) or 5 x 5 m (*maesopsis*). The activity is carried out manually. At KFP beating up is done 2-4 weeks after planting by replanting seedlings which died or are in a weak state.

Weeding

Both manual and chemical weeding is done at KFP as a way to control weeds. Spot weeding is done manually by clearing the area in a 1-meter radius immediately surrounding the seedling. One of the plantation operations at KFP is slashing of tall grasses. Slashing is done manually at KFP using bush knife where tall grasses and other herbaceous weeds compete with the seedlings.

Chemical weeding is used to a minimal extent, usually with roundup (Glyphosate) by spraying in the plantation site. The chemical is highly effective as it completely kills all weeds/grasses leaving the site void of weeds for a whole season. Slashing is done both in land preparation and as part of weed control.

Figure A.6.3.1: 1 year weeded pine crop

Pruning

Pruning will be carried out at KFP with the aim of improving the quality of poles by inhibiting the growth of knots and to reduce fire risk and damage. Pruning also improves access in the plantation. Pruning is done for pine, eucalyptus and maesopsis in accordance with the following pruning schedule:

Table A.6.3.2: Pruning schedule for Pines, Eucalyptus and Maesopsis

Regime	Age			No. of trees pruned/ ha	Mean dominant height (m)	Pruning height (m)
	Pine	Maesopsis	Eucalyptus			
1	4	-	3	All	4.5	2
2	8	6	6	750	9	4.5
3	11	11	8	500	12	6

Thinning

This is an important silvicultural operation done mainly to remove non-desirable trees so as to improve the growth rate of the remaining trees. Trees which are removed include those which are diseased and those with poor growth. However, thinning is principally done for the purpose of reducing tree density in order to enhance the form and growth of the remaining trees. Table A.6.3.3 shows the thinning schedule to be used – the specifications are based on NFA/ SPGS guidelines.

Table A.6.3.3 Thinning and harvesting schedule

Species	No. stems per ha	Non-commercial thinning		1st commercial thinning		2nd commercial thinning		Harvesting
		Age	Remaining stems per ha	Age	Remaining stems per ha	Age	Remaining stems per ha	Age
Pine	1,111	4	900	8	550	12	385	20
Eucalyptus	1,600	-	-	4	800	-	-	10
Maesopsis	400	4	280	8	168	12	118	22

For Eucalyptus the seedlings changed from 1600 to 1,111 per hectare with a spacing of 3x3m reducing the thinning intensity enhancing growth and form**.**

Survival assessment

This is carried out to determine the survival rate during the planting season. At KFP this task is scheduled to take place two weeks after planting so that beating-up can be carried out the same planting season where necessary. A further survival assessment is carried out 6-9 months following this, with replanting taking place if stands have a survival rate lower than 70%.

Fire control

Fire has been assessed to be one of the threats to KFP, but there are established strategies for preventing fire and fighting fire. These measures include the establishment of fire towers – one in the eastern and one in the western block - used for detection of fire; a standby fire crew during the main dry season and a general patrol team trained in fire measures all year round, to take care of any occurrence of fire within or outside project boundaries; and fire lines in place to stop the spread of fire into, out of and within the plantation. Internal fire lines around planted areas are 6 m wide whereas the external fire line around the edge of the property is 6-10 m.

Conservation areas

At the KFP more than 15 percent of the total project area has been set aside for conservation purposes. Within the project site these largely comprise of areas around wetlands, pockets of forest areas and scattered indigenous tree species. These have been set aside to meet the project conservation objectives, CCBA, FSC and other requirements under Ugandan law. The project also ensures the conservation of rare threatened and endangered tree species within the project area by educating local communities on the importance of conserving them.

Application of GIS:

In the proposed A/R CDM project activity, GIS is an essential tool for data management and informing decision-making. GIS will be employed in the planning, verification and monitoring of project implementation.

A.6.4. Transfer of technology/know-how,

A know-how transfer to the host party is not foreseen by the project. However, capacity building is expected to occur on the following activities:

The majority of field workers at the project are from the local community. Training is provided to staff to enable them to carry out their role at the plantation. Below is a list of the areas of training conducted at KFP that demonstrate transfer of technology/technology know-how:

1. Training of local community on nursery and silvicultural operations for establishing exotic and indigenous tree species

Plantation workers and local communities have been trained to ensure they have the necessary knowledge and skills on nursery and silvicultural operations. It was conducted by the project manager who divided the training into parts, namely nursery and silvicultural operations.

(a) Training on Nursery operations:
This aimed at providing nursery workers the necessary techniques on nursery operations such as seed sowing, pricking out, watering, weeding, pot mixing, root pruning, etc.

(b) Training on silvicultural operations:
This is always done for all new plantation employees for the company to help them understand the way to perform different silvilcultural operations such as planting, weeding, pruning, thinning, and other forest operations carried out up to harvesting.

Many of the workers are expected to demonstrate technology transfer by using knowledge learnt through KFP back in their villages, establishing and managing their own woodlots with greater success.

2. Training workshop on monitoring, prevention and control of out-break of diseases and pests as recommended by research institutions.

A specialist from Makerere University visited KFP in July 2009 to provide training on out-break of disease and pests. Training is planned moving forward for once a year. Plantation workers were trained on the signs, prevention and control of diseases and pests outbreak. Over 10 people attended the training. Topics covered during the training included:

- **Diseases and pest signs**

Description of different disease and pest signs were made by displaying the common signs of diseases through the use of pictures of affected trees. This aimed to create awareness to plantation workers on disease signs at the plantation so as to report to the project manager to prevent further spread and treatment.

- **Diseases and pest control**

Methods used in controlling pests and diseases when they occur were described in detail in the training session. The workers acquire much information on ways of controlling pests and disease breakout and spread.

Due to the training, greater awareness has been created among local people and workers making them effective in detecting and reporting signs of diseases or pests immediately they are discovered. It has placed them in better position to be able to understand different diseases and pest that can affect their own trees in woodlots as well.

3. Training of stand-by fire fighters.

Training on fire fighting has been conducted by SPGS through workshops taking place at various sites around Uganda since 2004. Fire fighter employees have attended such workshops, which typically lasted 2-3 days. SPGS' workshops are an on-going capacity building initiative which KFP intends to use in the future (the latest fire training workshop took place on the 17th and 18th December 2009)

Two approaches were used in the SPGS training:

1. Theoretical knowledge: workers were trained on issues including the effect of forest and buildings fires, types of forest fires, fire protective gears, etc

2. Practical implementation: workers were trained on forest and building fire suppression using modern technology and other items used in firefighting. During the training, practical demonstrations to show the ways to attack forest fires were done. Training on the use of other firefighting equipment was also carried out at the same time

4. Training of workers on management of fertilizer

Education on the management of fertilizers was conducted by NFA and SPGS for nursery workers at KFP. As fertilizer application in the field is not common practice, it is only necessary for nursery workers to be trained on this. Plantation supervisors were also trained by SPGS the spraying precautions.

All nursery workers were taught good handling of fertilizers by showing appropriate containers for the handling of fertilizers, safety gear for handling fertilizers and other agro-chemicals.

A.7. Approach to addressing non-permanence

>> KFP aims to provide a sustainable source of timber which will be sold in Uganda, other countries in East Africa and beyond. Therefore, the project activity is planned for the long-term, and as such has opted to have two crediting period renewals at 20-year intervals, meaning a total A/R CDM project lifetime of 60 years. In accordance with paragraph 38 and Section K of the CDM A/R modalities and procedures, this project adopts the approach of **issuance of tCERs** to address the non-permanence and account for the net anthropogenic GHG removals by sinks.

A.8. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Republic of Uganda (host)	• Busoga Forestry Co. Ltd • Green Resources AS	Yes

A.9. Public funding of project activity

>> Public funding from Parties included in Annex 1 is involved. See Annex 2 for information on sources of public funding.

A.10. History of project activity

>> As shown in the FAO's Global Forest Resources Assessment 2005, since 1990 Uganda's forests and wooded lands have decreased from approximately 6.3 million to 4.7 million hectares, which presents one of the highest deforestation rates in the world over the last decade. Furthermore, records from NEMA indicate that back in 1890 approximately 10.8 million hectares, equivalent to 45% of Uganda's land area, was forest and woodland. In light of this, it is not surprising that deforestation, or more specifically degradation of savanna woodland, has been present at KFP over the last century, principally due to the prevailing land-use of subsistence agriculture, fuelwood collection, charcoal production and grazing activities. Key policies, regulations and events have acted as precursors to this land-use change and thus driven the extent of the land-cover change.

Contrary to the widespread land-use explained above, some attempts were made by the government to reforest a small part of the reserve in the 1970s using pine species, in particular *Pinus caribea* and *Pinus oocarpa*. The result of this is apparent in the northern-central area of the reserve where the mature plantations can be seen. However, the government was unable to continue with this programme due to financial constraints coupled with the political instability during the following years, which resulted in reforestation attempts ceasing. No attempts of tree planting have been made within the area of the A/R CDM project activity.

Uganda experienced a period of instability during the 1970s with the dictatorship of Idi Amin; a time characterized by political repression, corruption and human rights abuses, and culminating in the Liberation War between Uganda and Tanzania at the end of the decade. Further insecurities proceeded into the early 1980s after the return to power of Milton Obote, which led to an insurgency causing widespread conflict. This era of Uganda's history had strong repercussions for almost all aspects of the country's economy - including the land-use and forestry sector - and meant that people were forced to meet immediate livelihood needs as oppose to long-term needs.

In the early 1970s, the Government of Uganda encouraged the growing of agricultural crops in Central Forest Reserves (CFRs) in a campaign to increase agricultural output. Inevitably this resulted in mass encroachment of CFRs, and successive governments have struggled to reverse this action. This was also the first time that illegal logging by pit-sawing became common practice; another activity which became difficult to control.

Another important factor pertaining to the increased pressure on the land has been the rapid population increase, which almost doubled between 1980 and 2002. This vastly increased the demand of food and employment which could not be met by equivalent supply. Such a disparity meant many local communities had no other option but to resort to subsistence living in an unsustainable manner. Thickets and forests became degraded as people exerted them for firewood, charcoal production, timber and clearing virgin land for cultivation and grazing.

A.11. Debundling

>> Not Applicable

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

>> Approved afforestation and reforestation baseline and monitoring methodology AR-AM0004, "Reforestation or afforestation of land currently under agricultural use" version 4[20].

Tools referenced in methodology, and subsequently used in PDD:

Tool for the demonstration and assessment of additionality in A/R CDM project activities

B.2. Applicability of methodologies and standardized baselines

>> In the absence of the project activity, the land is expected to be exposed to further encroachment from the local communities with more land-class change from shrub and grassland to degraded cropland, and depletion of remaining pockets of forest due to fuel-wood collection and charcoal production, all resulting in further degradation of the land. The selected methodology therefore follows the baseline approach from paragraph 22(a) of the CDM A/R modalities and procedures – "Existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary." The proposed A/R CDM project activity complies with the applicability conditions provided in the methodology as follows:

• *Lands to be afforested or reforested are degraded and the lands are still degrading or remain in a low carbon steady state*

The project area has seen large changes in vegetation cover over the last three decades, as shown from the NFA maps and the Ecological Survey, with woodland vegetation being depleted to a land-class representing shurb and grassland – demonstrating a clear pattern of degradation. Much of the forest has been cleared illegally by local communities, who have encroached into the forest reserve, using fire to make space for cultivation and charcoal production. The lands would have continued to degrade at the historic rate in the absence of the project, with further infliction to burning for agricultural purposes. The Landsat image from 1989 together with the current landuse map shown in A.2.1.3.1 illustrates that the few remaining pockets of natural forest from 1989 were deforested within this interval.

• *Site preparation does not cause significant longer-term net decrease of soil carbon stocks or increases of non-CO2 emissions from soil;*

Significant long-term net decreases of soil carbon stocks or increases of non-CO2 emissions from soil will not occur due to site preparation as only small pits of diameter 20-30 cm and depth 30-40 cm are dug at a spacing of 2.5 x 2.5 m, 3 x 3 m or 5 x 5 m for planting. Ploughing will not be used for land preparation. Spot weeding is carried out 1m around the plant for 2 years, done manually by slashing, to protect the young trees from weed competition.

• *Carbon stocks in soil organic carbon, litter and deadwood can be expected to further decrease due to soil erosion and human intervention or increase less in the absence of the project activity, relative to the project scenario;*

[20] http://cdm.unfccc.int/EB/Meetings/038/eb42_repan08.pdf

In the absence of the project, the area would remain exposed to the detriment of the past pattern of human intervention: further degradation due to fire regimes for subsistence agriculture and charcoal production. The soil organic matter and deadwood would also be expected to increase less in the absence of the project activity, relative to the reforestation, as grass and shrublands under tropical conditions have less soil carbon compared to plantations. Therefore, not accounting for soil organic carbon is a conservative approach for the project case as it is expected to increase less or decrease more in the absence of the project activity relative to the baseline because of reduced fire.

• *Flooding irrigation is not permitted;*

There will be no flooding irrigation used in the project activity.

• *Soil drainage and disturbance are insignificant, so that non CO2-greenhouse gas emissions from these types of activities can be neglected;*

Mechanical site preparation through ploughing will not be used. Therefore, no non-CO2 GHG emissions are expected. Soil drainage is not expected to occur since species are planted in appropriate locations where existing drainage is adequate.

• *The A/R CDM project activity is implemented on land where there are no other on-going or planned A/R activites (no afforestation/reforestation in the baseline)*

Due to the degraded feature of the land, economical unattractiveness, identifiable barriers (unavailable funds, inaccessible commercial bank loans, lack of capacity for successful planting and management, inadequate institutional arrangements) and market risks that prevent investors or local communities using the land in a manner that will lead to carbon sequestration, the lands to be reforested, without the proposed A/R CDM project activity, will continue under marginal agriculture as they have in the last decade. The land is currently under subsistence agriculture and would continue under agricultural use without A/R CDM project activity.

As can be seen in Table B.3.1 the methodology only provides for estimation of carbon stock changes in the living (above- and below-ground) biomass pools of the A/R CDM project activities. The exclusion of deadwood, litter and soil organic carbon is conservative considering the increase in carbon accumulated in these pools over the crediting period, in comparison to the baseline scenario.

B.3. Carbon pools, sources and greenhouse gases (GHGs)

Table B.3.1. Carbo pools, sources and greenhouse gases

Carbon pools		Selected?	Justification/Explanation
Baseline	Above- ground	Yes	Major carbon pool subjected to the project activity
	Below- ground	Yes	Major carbon pool subjected to the project activity
	Dead wood	No	Conservative approach under the applicability condition
	Litter	No	Conservative approach under the applicability condition
	Soil organic carbon	No	Conservative approach under the applicability condition
t	Above- ground	Yes	Major carbon pool subjected to the project activity

Carbon pools		Selected?	Justification/Explanation
	Below- ground	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity

Source		GHG	Included ?	Justification/Explanation
Baseline	Burning of biomass	CO_2	No	However, carbon stock decreases due to burning are accounted as a carbon stock change
		CH4	Yes	Non-CO2 gas emitted from biomass burning
		N2O	No	Non-CO2 gas emitted from biomass burning
Project activity	Above- ground	CO_2	Yes	Major carbon pool subjected to the project activity
		CH_4	No	-
		N_2O	No	-
	Below- ground	CO_2	Yes	Carbon stock in this pool is expected to increase due to the implementation of the project activity
		CH_4	No	-
		N_2O	No	-

Deadwood and litter are minimal in the baseline scenario. As a result of woodland clearance for fuel-wood, charcoal production and subsistence agriculture, the majority of the project area has changed to a grass and shrubland land-class with only sparsely scattered trees. This has meant that the litter and deadwood carbon pools are of minor significance, especially as they will be greatly increased under the plantation conditions as more, woody biomass is accumulated.

The grounds for neglecting soil carbon pool are demonstrated through following the tool *"Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in A/R CDM project activities"*:

The project complies with the requirements of this tool for the following reasons:

1. The plantable area does not include organic soils (e.g., peatlands) or wetlands.

2. The rate of loss of carbon stocks in mineral soils due to erosion within the project boundary shall not be permanently increased above baseline rates by the CDM A/R project activity, because:

- Although the removal of existing vegetation during site preparation occurs on more than 10% of the project area, land-clearance through burning to create areas for subsistence agriculture, fuel-wood collection and charcoal production are all common practice in the baseline scenario
- Soil disturbance associated with site preparation for the CDM A/R activity does not exceed 10% of the project area
- Ploughing/ripping and scarification will not be used for site preparation

3. Fine litter (woody twigs less than 2mm diameter, bark and leaves) will remain on site.

Changes in the carbon stocks of the mineral soil component of the soil organic carbon pool may be conservatively neglected in the CDM A/R project, during the calculation of net GHG removals by sinks, because the baseline carbon stock in mineral soils within the project boundary is declining due to conversion of the grass and shrubland stratum to cropland.

B.4. Establishment and description of baseline scenario

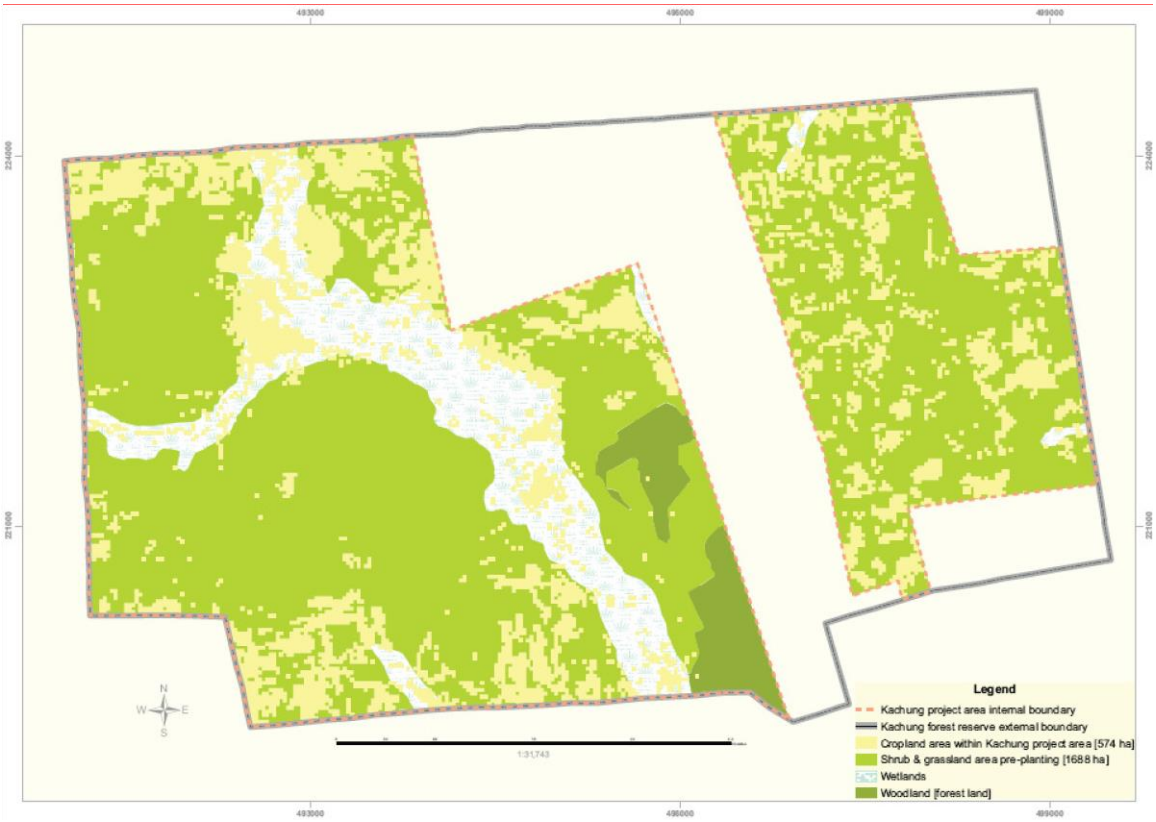
>> • Baseline net GHG removals by sinks:

Stratification of the baseline carbon stocks was based on the major different vegetation classes found in the project area. Initial ground truthing was carried out to obtain an idea of the different vegetation types – this was also supported by findings from the Ecological Survey. The two baseline strata identified were:

1. *Shrub and grassland*
2. *Cropland*

Mapping and delineation of the two strata was carried out through the analysis of satellite imagery (LandSat 7 SLC-off; image from February 2006).

Figure B.4.1 Baseline stratification of KFP

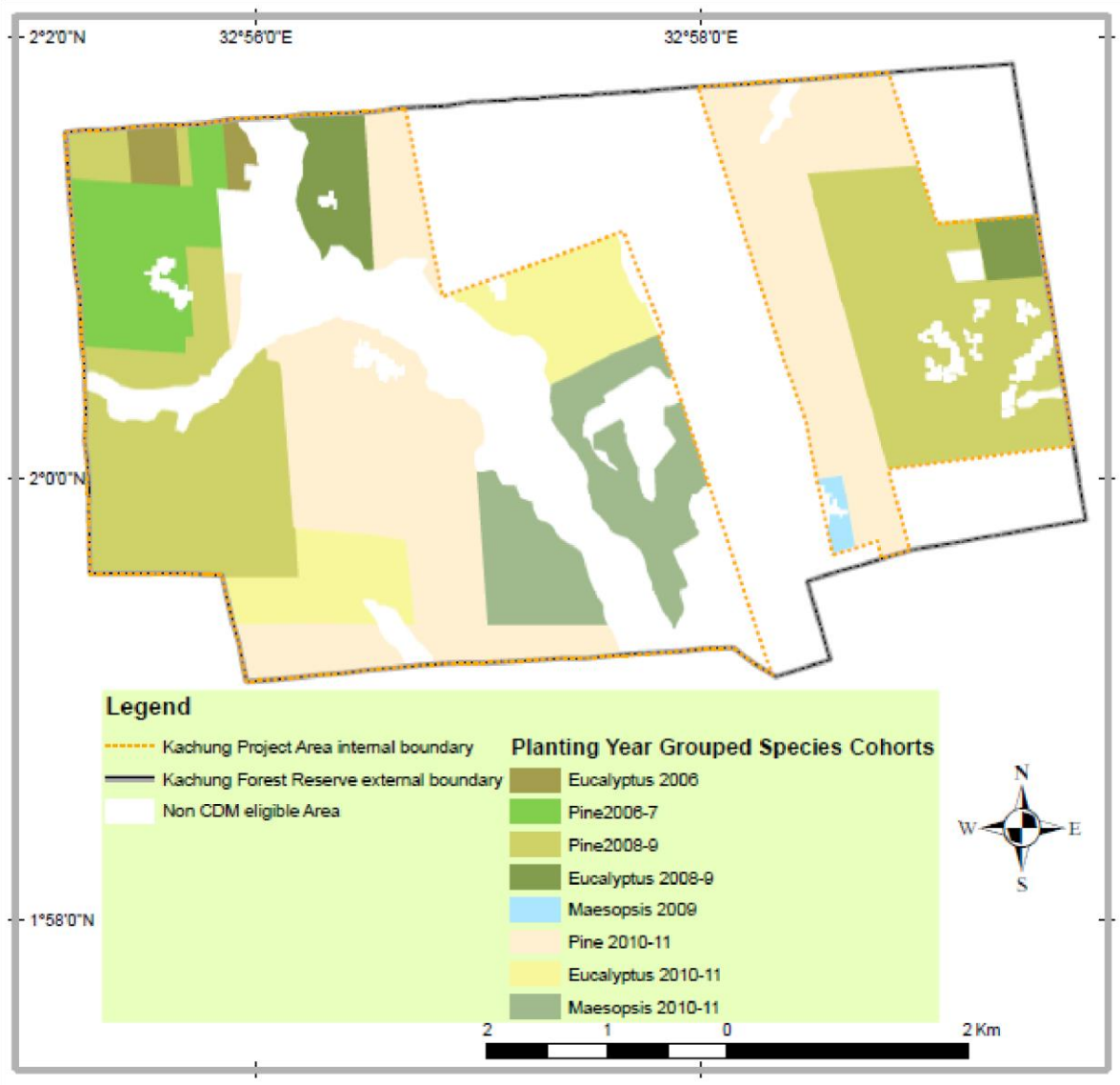


• Actual net GHG removals by sinks:

The *ex ante* stratification of the actual net GHG removals by sinks is based on the project planting schedule, with species grouped into two year cohorts. Environmental conditions

of the project area, such as soils and topography, are similar throughout, and thus deemed suitable for all species planned to be planted.

Figure B.4.2 ex ante actual net GHG removals by sinks stratification



B.5. Demonstration of additionality

The steps as outlined in the A/R Methodological tool "Tool for the demonstration and assessment of additionality in A/R CDM projects" are followed to demonstrate that the proposed A/R CDM project activity is additional.

Step 0: Preliminary screening based on the starting date of the A/R project activity

The A/R CDM project started on the 1st October 2006. This is the date when first planting began. The agreement on cooperation modalities between NAG AS and GRAS (formerly known as TreeFarms AS) with regards to the investment and takeover of LFC (formerly

NAG (U)) was signed on 27th April 2006[21]. Following the development of the co-operation modalities, GRAS, then known as TreeFarms AS, formally bought out LFC, becoming the largest shareholder of the company and in doing so, facilitating financial capacity to implement KFP. No planting took place before GRAS' investment.

The concept that reforestation at Kachung would be financially viable through the inclusion of a revenue stream from the sale of CERs was a key component of the decision making to invest in NAG. Since start up, GRAS, formerly TreeFarms AS, has had carbon financing as an integral part of its business plan. This is sustained by a number of Board Meeting minutes of TreeFarms AS – the "mother" company of GRAS subsidiaries - from as early as 1999, which clearly show that carbon financing was considered prior to the start of KFP[22]. Although these documents were not directly made publically available at the time, the information relating to carbon financing was made available on the company's website prior to project start, clearly outlining that carbon financing is a core component of GRAS and its subsidiaries' business objectives. The company objective can also be sustained by NGO reports from 2000[23], which clearly state that TreeFarms AS is developing carbon forestry projects in Uganda; furthermore, this report references the old company website (www.tree-farm.com), where much of the information was obtained – this is how the data from the documentation provided was made available to third parties.

In addition, TreeFarms AS' 2006 Annual Report[24] has a section on its carbon offset business, which was made available to third parties.

Step 1: Identification of alternative land use scenarios to the proposed A/R CDM project activity

Sub-step 1a: Identify credible alternative land use scenarios to the proposed CDM project activity

As elaborated in section B.5.1, Step 3, part (d), the only identified realistic and credible land-use scenario that would have occurred on the land within the proposed project boundary in the absence of the reforestation project under the CDM is a continuation of the current land-use: degradation of the grass and shrubland stratum of the reserve to cropland or degraded grazing/grassland.

Sub-step 1b: Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

The identified realistic and credible land-use scenario of further degradation of the land due to encroachment activities is not in compliance with all applicable legislation and regulations as encroachment of forest reserves for activities other than tree planting is illegal. However, the scenario is valid because of the systematic lack of enforcement of applicable laws and regulations, as described below:

In a Forest Reserve, settlements or activities such as charcoal making or pasture are not permitted. Only dry or dead wood may, in reasonable quantities, be cut and taken free of any charge by members of local communities (National Forest and Tree Planting Act Section 33, August 2003). Illegal encroachment for various small-scale land-uses has been a continuous practice of local communities until the start of the project activity, as the NFA

[21] Agreement between Norwegian Afforestation Group AS (NAG AS) and TreeFarms AS, Regarding the cooperation modalities about operations of NAG (Uganda) Ltd. 27th April 2006

[22] TreeFarms AS, Board Meeting Minutes: January 1999, December 1999, March 2000

[23] NGO reports shared with DOE

[24] TreeFarms AS, Green Resources, Annual Report 2006

has been without the resources to implement patrols or other methods to enforce these laws (NFA has just two officers for its administrative district unit). In light of this, continuations of the pre-project land use is not in compliance with applicable laws and regulation, but as the illegal activities have taken place on more than 30% of the Reserve, as an administrative unit, this is still inline with the A/R CDM methodology., unless it is specifically required by a permit holder paying fees etc.

The scenario of the local government reforesting the reserve would be consistent with enforced mandatory and applicable laws and regulations.

Step 2: Investment analysis

Step 2a: Determine appropriate analysis method

Option III, benchmark analysis is applied.

Step 2b – Option III. Apply benchmark analysis

The equity Internal Rate of Return (IRR) has been applied as the financial indicator for the A/R CDM project since the financing used for the development of KFP is from equity investment in GRAS.

In line with the Additionality Tool, the benchmark is to represent standard returns in the market, considering the specific risk of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer.

The benchmark has been derived from option two of the Additionality Tool:

- Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers' views and private equity investors/ funds' required return on comparable projects

To obtain such a benchmark, the ideal method would be to analyze IRR expectations for private forestry operations in Uganda. However, this was not possible due to the very limited development of the sector, particularly for private investments on a scale similar to that of the A/R CDM project.

Although data for required returns on capital was not available for forestry within Uganda, it was possible to look more generally at equity investments within the country. Ibbotson Associates (www.ibbotson.com), a leading provider of independent investment research in major international markets, annually determine the required return of capital for investments in 173 countries from the perspectives of foreign investors. The statistics represent the IRR-return that an investor would expect to receive if investing in a particular country. The report looks at perspectives from six different countries (UK, France, Germany, Canada, Japan and Australia) and applies both a linear and logarithmic scale of the Country Risk Rating Model to determine the according IRRs. In total, 12 IRR-values are provided covering all six countries and the two different model scales.

For 2005 investments in Uganda, the analysis shows a range of required IRRs of 27.07 – 34.67 %, with an average of 31.55% for all country perspectives with both models

(Ibbotson Associates, 2005[25]). Taking the lower value of 27% from this range, an indication of the standard returns that an investor would expect to receive for investing in Uganda is determined.

GRAS' equity investors proceeded with investment in KFP due to its potential to provide an expected total return of 25% in the long term[26]. The benchmark was therefore conservatively assumed to be 25% based on GRAS' private equity investors' risk exposure and the 27% standard return on equity, as substantiated by Ibbotson Associates' 2005 Cost of Capital report.

Benchmark = 25%

Step 2c: Calculation and comparison of financial indicators

The financial model to determine the IRR at KFP was developed using justified plantation assumptions and costs – the majority of which were substantiated through contract examples or government documentation. The costs were on a per hectare basis and linked to the planting schedule which scaled the costs up to the total project area. Beating up (replanting) for 10% of the plantable areas was conservatively assumed to account for any mortality that may occur. For second rotations, it was assumed that the eucalyptus stands will be coppiced (thus, no establishment costs – just maintenance costs assumed) and the pine and *maesopsis* stands would be replanted, assuming the same establishment and maintenance costs as initial planting.

The cost inputs to the financial model are shown below**:**

Table B.5.1. Cost input parameters

Parameter	**Cost**
Annual land rent per ha planted	6,600 Ush per ha planted
Seedlings	275 – 400 Ush per seedling
Land preparation and planting activities	33,000 – 35,000 Ush per ha
Crop management	30,000 – 34,000 Ush per ha
Chemical costs: Pesticide Herbicide NPK Fertilizer	 0.02 USD per seedling 20 USD per ha 0.03 USD per seedling
Chemical application labour	9,000 per ha
Fire protection	34,000 Ush per ha per year

[25] IbbotsonAssociates, 2005: International Cost of Capital Perspectives Report 2005. The report has been submitted to the DOE but cannot be published on the UNFCCC website due to copyright constraints

[26] Further evidence of the benchmark is provided by private equity investors – documentation available to DOE

Road costs Construction Maintenance	 1,310 USD per km 432 USD per km
Exchange rate	1,908 Ush to 1 USD

Revenues from each timber species, the sale of tCERs and SPGS funding were accounted for in the model. Harvested timber volumes were inputted from the carbon model, which used the merchantable timber yield models by Alder (2004) and Buchholz (2003) to determine the amount of timber that will be available at the planned commercial thinning and harvesting years according to the schedule presented in Table A.6.3.3. The assumed wood prices were as follows:

Table B.5.2 Assumed stumpage prices in IRR calculation

Species and timber type	Price, Ush
Pine	
First thinning	39,910,[27]
Second thinning	59,865[28]
Harvest	79,820[29]
Eucalyptus	
Thinning	25,1205[30]
Harvest	50,240[32]
Maesopsis	
First thinning	39,910[30]
Second thinning	59,865[31]
Harvest	79,820[30]

A wood price increment of 2% for all wood prices was assumed for the first 10 years of the project. This is to factor in the increases in timber/ wood prices that have occurred recently in East Africa.[3132] Wood prices have not been assumed to increase beyond 10 years due to the uncertainty linked to forecasting so far in the future and also due to the likely stabilisation of regional wood prices with global prices.

[27] All first thinnings, including the thinning for Eucalyptus, assumed to be half the harvesting price

[28] All second thinnings assumed to be three quarters of harvested price

[29] Calculated as a weighted average of NFA harvesting license prices from the NFA website: http://www.nfa.org.ug/content.php?submenu_id=5

[30] Maesopsis timber prices assumed to be equal to pine prices

[31] GRAS Annual Report 2008, page 11

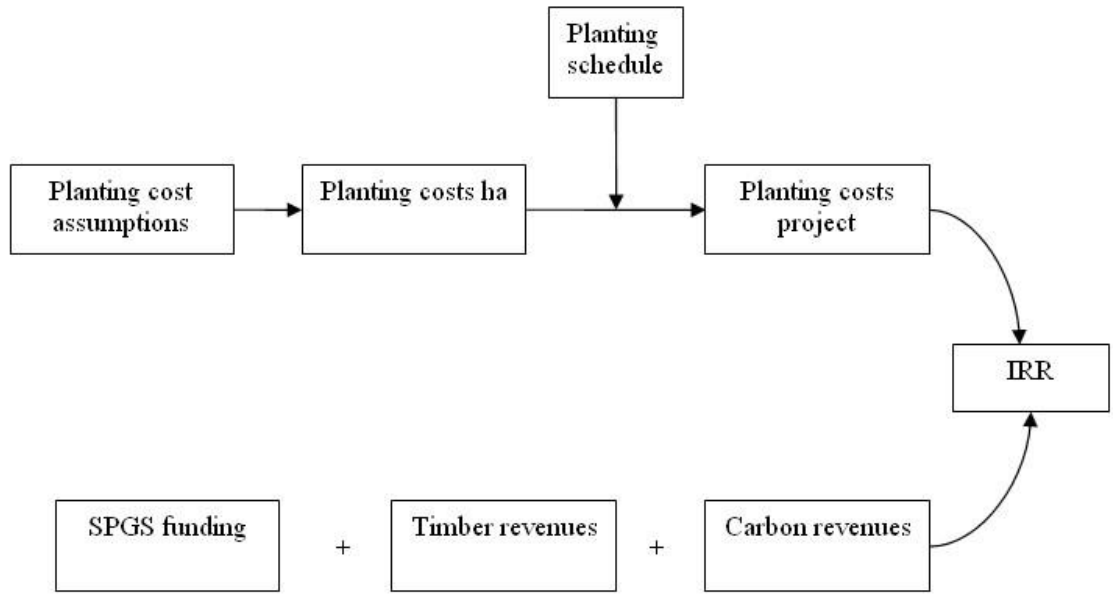
[32] Based on carbon price indications from State and Trends of the Carbon Market 2005, World Bank and IETA, Washington DC, May 2005

Table B.5.3. Assumed carbon prices in IRR calculations

tCER price range[36]
$3
$7.15

A corporate tax rate of 30% is assumed in the model, which is based on what the corporate tax rate was at the start of the project[33]. Figure B.5.4, shown below, outlines the structure of the financial model as presented in Excel. The timeframe of the model is from 2006 to 2033. This period is from first planting to final harvesting of the first rotation of *maesopsis* – the longest rotation species being planted at KFP. Although the time frame of the investment analysis was from 2006 to 2034, some of the planting within this period would have value beyond this time horizon. For example, pine planting costs which are incurred in 2030 would realise harvesting revenues in 2050. Carbon finance benefits would similarly reach beyond this time period.
Residual values such as these were therefore included within the IRR calculation so that all the potential value derived from the 2006 – 2034 planting period was captured.

Figure B.5.4. Schematic of financial model components



The IRR based on the above assumptions, without the sale of tCERs, has been calculated as 17.2%. The A/R CDM project activity has a less favourable indicator than the benchmark of 25% and is therefore not considered financially attractive without the benefits from the sale of tCERs. The project would therefore not have been viable without the potential of carbon financing.

Project scenario	IRR

[33] http://data.worldbank.org/indicator/GB.TAX.CMAR.ZS

Solely timber revenues	17.2%
Timber revenues + SPGS funding	18.4%
Timber revenues + SPGS funding + tCERs (price $3)	21.4%
Timber revenues + SPGS funding + tCERs (price $7.15)	25.4%

Step 2d: Sensitivity analysis

Sensitivity analysis was carried out to test whether the financial attractiveness was robust to reasonable variations in key parameters. The critical parameters were identified as timber prices, inflation, planting costs and carbon revenues. A price increase of 10% was assumed for timber - applied to thinnings and final harvestings for all species.

Table B.5.5. Sensitivity analysis of financial analysis

Parameter change	**IRR, without tCER sale**	**IRR, without tCER sale but with SPGS**	**IRR, with tCER sale (price $3)**	**IRR, with tCER sale (price $7.15)**
Standard assumptions	17.2%	18.4%	21.4%	25.4%
10% increase in timber prices	18.0%	19.3%	22.2%	25.9%
10% decrease in timber prices	16.3%	17.5%	20.7%	24.7%
10% increase in Capex	17.1%	18.4%	21.3%	25.2%
10% decrease in Capex	17.3%	18.6%	21.6%	25.6%

As shown in Table B.5.5, the sensitivity analysis demonstrates that the IRR of the A/R CDM project is robust to reasonable variations in the critical assumptions, remaining financially unattractive without revenues from the sale of tCERs.

Step 3: Barrier analysis

Barrier analysis has not been applied.

Step 4: Common practice analysis

Forestry plantations are rare in Uganda with private sector plantations even more so. No similar forestry activities have been implemented or are currently underway without the support of carbon financing, as although some government plantations were established in the central area of the reserve, these were on a much smaller scale to the A/R CDM project (345 ha). The government plantations were also implemented before the 31st December 1989. Small scale plantation forestry has also been done on small private forestland and as a means of protection against erosion in larger tea and coffee plantations, but similarly this doesn't class as the same activity.

The government plantations are now owned by a local saw-miller who was granted a concession for harvesting and converting the pine species previously planted by the government on condition that the concessionaire replanted the area. This scenario is unique, and even though it shows a private individual developing a forest plantation

(though on a significantly smaller scale), it has only been facilitated due to the opportunity to sell the standing timber of the previous government plantation, reducing the principle barrier to the forestry sector of large front loaded costs.

See section B.5.1 part d) for further evidence of private forest plantations not being common practice. GRAS also has another reforestation project that is being developed in Uganda – the Bukaleba Forest Project. This project was also developed considering carbon finance from the sale of emission reductions; however, the project is not eligible for CDM or VCS certification due to the early start date rules. GRAS is now pursuing development of the Bukaleba Forest Project under the American Carbon Registry (ACR).

With step 4 being satisfied, the proposed A/R CDM project activity is considered additional.

B.6. Estimation of net anthropogenic removals

B.6.1. Explanation of methodological choices

The estimates of the actual net GHG removals by sinks in the project activity are based on the carbon stock change in aboveground and belowground biomass, estimated using equations described in Section II.7 of the approved methodology. The changes in carbon stocks in the living biomass pool are estimated based on the changes in carbon stocks of the living biomass of trees (gain and losses) minus the carbon stock in the living biomass carbon pools of non-tree woody vegetation in the year of site preparation, shown by equation 14. As described in Section B, carbon stock changes in pools of soil organic matter, dead wood and litter are not accounted as part of the net GHG removals by sinks.

Treatment of pre-existing vegetation

As described in section A.6, the main site preparation that takes place is slashing and pitting. Therefore mature vegetation, such as large trees, is not cleared for site preparation.

AR-AM0004 Version 04 presents two possible situations for treatment of pre-existing vegetation: pre-existing carbon stocks in the living biomass are *not* significant, as pre-existing carbon stocks in the living biomass are < 2% of the anticipated actual net GHG removals by sinks, or preexisting carbon stocks in the living biomass *are* significant, with more than 2% of anticipated actual net GHG removals by sinks. In addition, EB 50, Annex 21, provides guidelines on conditions under which GHG emissions from removal of existing vegetation due to site preparation are insignificant. Condition (c) from part 2 of the guidance states that if “the baseline scenario is *degrading land* involving decline in woody vegetation cover”, then the “GHG emissions from felling, clearance, decay or burning of existing woody biomass during site preparation are insignificant”. As shown in step 3 (b) of B.5 of the PDD, evidence has been provided that indicates that the project baseline has been historical degradation, including a soil degradation map of the region in Uganda and NFA maps showing a change in land-class from predominantly woodland vegetation to bush vegetation. The Ecological Survey for the project area also describes a general trend of degradation over time due to encroachment activities from the local communities.

In accordance with EB 50, Annex 21, GHG emissions from the removal of existing vegetation due to site preparation at KFP are neglected and accounted as zero.

Treatment of trees

The stock change method, *Method* 2, of section 7.1 B was used (21 and 22) along with equations 10 and 11 to determine the *ex ante* changes in living biomass carbon stock in the project scenario. Disturbances are assumed in the *ex ante* estimation, such as potential fire, pest and disease outbreaks, but of frequency and intensity. The mortality factor is therefore assumed to be 10% (accounted for in the yield models).

In the absence of the project and regional specific parameters during PDD preparation for the biomass expansion factors (BEF), wood density (D), carbon fraction (CF) and root-to-shoot ratio, the project participants have used default values from the GPG LULUCF 2003 (Table 3A.1.10). The BEFs given in Table 3A.1.10 represent averages for mean growing stock or age. The variables to be used in equation B.18 and B.19 are shown in the table D.1 below:

Table B.6.1.1 Wood density, BEF and Root-Shoot ratio for species used

Tree species	Wood Density (tonnes d.m.m-3)	BEF	Root-Shoot ratio
Eucalyptus	0.526[34]	2.7[35]	*[36]
Pine	0.51[37]	1.25[38]	*[39]
Maesopsis eminii	0.41[40]	3.4[41]	0.27[42]

*EB70, A35: R = exp(-1.085+0.9256*ln(A)), where A is above ground biomass per ha

The value now used for eucalyptus refers to basic wood density and is country and species specific. It is from a recent study1 on the strength properties of timber species in Uganda and is thus considered more precise. This change is considered acceptable in line with paragraph (p) of EB 66 Annex 24 since it enables a more precise estimation of the carbon stocks – see section D.2.for more information.

As for the BEF values, the source remains the same, IPCC GPG 2003, as this is the most reliable source found available, but PP adopted a conservative approach by using the value that falls half way between the mean value and the lower value of the range instead of using the mean value of the range for each species.

The parameters, as listed in Table B.1.1, fall within the range provided by the GPG LULUCF 2003 (Table 3A.1.10) or are supported by other regional literature. The growth data from "*Yield of Eucalyptus and Caribbean pine in Uganda, D. Alder et al. 2003"* and "*Maesopsis eminii – a challenging timber tree species in Uganda – a production model for commercial forestry and small holders, T.Buchholz et al."* were used to project the

[34] A. Zziwa, Y.N. Ziraba and J.A. Mwakali, Strength properties of selected Uganda timbers, International Wood Products Journal, vol 1, no1, 2010.

[35] Taken from Table 3A.1.10 of the GPG LULUCF 2003, BEF_2 (overbark) for Tropical Broadleaf

[36] Taken from Table 3A.1.8 of the GPG LULUCF 2003, Mean value for Eucalypt plantation with aboveground biomass (t/ha) of >150

[37] Taken from Table 3A.1.9-2 of the GPG LULUCF 2003. Value for Tropical America, Pinus Caribaea

[38] Taken from Table 3A.1.10 of the GPG LULUCF 2003, BEF_2 (overbark) for Pines

[39] Taken from Table 3A.1.8 of the GPG LULUCF 2003, Mean value for Conifer forest/ plantation with aboveground biomass (t/ha) of >150

[40] Taken from Table 3A.1.9-2 of the GPG LULUCF 2003. Value for Tropical Africa, Maesopsis Eminii

[41] Taken from Table 3A.1.10 of the GPG LULUCF 2003, BEF_2 (overbark) for Tropical Broadleaf

[42] Taken from Table 3A.1.8 of the GPG LULUCF 2003, Mean value for Tropical/ sub tropical dry forest

merchantable timber volume and thus the biomass growth of the plantations. The project participants will conduct annual inventories to verify applicability of these data in the project. During *ex-post* calculations, the growth data (standing volume per hectare) will be collected and converted into biomass through Wood Density (WD) and Biomass Expansion Factors (BEF) and root-shoot ratio (R) using equations and steps described in the methodology.

The project participants consider that any changes due to thinning have been taken into consideration in the growth figures that were used; however, the trend shall be monitored. The impact of disturbances, e.g. losses from fire and pests, are considered to be small and are a result of natural events. Losses due to commercial harvests and thinnings during the crediting period shall be captured in the calculations using equation 21.

Increase in emissions of greenhouse gases:

According to the approved methodology, the increase in emissions of GHG gases resulting from loss of biomass due to conversion of pre-existing vegetation (excluding loss of biomass from herbaceous vegetation) and burning of biomass must be quantified, unless conditions at the site, following guidelines from EB 50, Annex 21, are deemed insignificant. The project participants do not practice tillage, machinery or site burning during site preparation. The increase of GHG emissions from any unplanned fire will also be quantified. The actual net GHG removals by sinks (annual and cumulative) is the carbon stock change in above- and below-ground biomass minus the increase in anthropogenic emissions and are listed in Table B.6.4 below.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	DLP, Desired level of precision (e.g. 10%)
Data unit	%
Description	± 10%
Source of data	-
Value(s) applied	-
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	For the purpose of QA/QC and measuring and monitoring precision control

Data/Parameter	CF_j, Carbon fraction of species *j*
Data unit	t C (t d.m.)-2-
Description	-
Source of data	IPCC default
Value(s) applied	0.47
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	BEF, Biomass expansion factor (BEF)
Data unit	Dimensionless
Description	-
Source of data	GPG LULUCF 2003
Value(s) applied	Eucalyptus: 3.4 Pine: 1.3
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	CE, Average biomass combustion efficiency
Data unit	-
Description	-
Source of data	IPCC default value (0.5) is used if no appropriate value
Value(s) applied	0.5
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	Dj, Wood density of species j
Data unit	t d.m. m-3
Description	t d.m. m-3
Source of data	Local-derived and IPCC GPG LULUCF (see table D.1.1)
Value(s) applied	Pine: 0.51, Eucalyptus: 0.526, *Maesopsis*: 0.41
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	species specific value have the priority

Data/Parameter	D, Average wood density
Data unit	t d.m. m-3
Description	-
Source of data	Based on IPCC GPG LULUCF 2003
Value(s) applied	0.55
Choice of data or measurement methods and procedures	Average wood density used is higher than of that for the species found in the baseline
Purpose of data	-
Additional comment	-

Data/Parameter	zα/2, Value of the statistic z (normal probability density function), for α = 0.1 (implying a 90% confidence level)
Data unit	Dimensionless
Description	-
Source of data	Statistic book
Value(s) applied	1.645
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	PLik, Total number of plots in stratum i, stand model k
Data unit	Dimensionless
Description	-
Source of data	Field measurement
Value(s) applied	Measured
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	Ai, Area of each stratum
Data unit	Hectares
Description	-
Source of data	GIS or/and GPS
Value(s) applied	Measured
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	$B_{ijt,}$ Average above-ground biomass stock before burning for stratum *i*, species *j*, time *t*
Data unit	t d.m ha^{-1}
Description	-
Source of data	Field measurement
Value(s) applied	-
Choice of data or measurement methods and procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	sti, Standard deviation for each stratum i; dimensionless
Data unit	Depending on the parameter
Description	Calculations
Source of data	-
Value(s) applied	Calculated
Choice of data or measurement methods and procedures	At each monitoring event
Purpose of data	-
Additional comment	Used for estimating numbers of sample plots of each stratum and stand, as necessary

B.6.3. Ex ante calculation of net anthropogenic removals

>> AR-AM0004/ Version 4 covers sources of leakage from:

- Carbon stock decreases caused by displacement of pre-project agricultural crops, grazing and fuel-wood collection activities;

Carbon stock decreases caused by the increased use of wood posts for fencing are neglected based on EB 44, paragraph 37 (c), which states that the "collection of wood from the non-renewable sources to be used for fencing of the project area" is "insignificant in A/R CDM project activities and may therefore be neglected in A/R baseline and monitoring methodologies.

No other leakage is anticipated by the project.

Following condition (q) of the "Guidelines on accounting of specified types of changes in A/R
CDM project activities from the description in registered project design documents" (EB66, Annex 24), the project participants have chosen to change the PDD's leakage and monitoring section by applying the A/R CDM tool "Estimation of the increase in greenhouse gas (GHG) emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity (EB51, Annex 15)" instead of the methodology's provisions for determining leakage caused by displacement of pre-project agricultural crops and grazing. Leakage due to fuel-wood collection will still be determined following the methodology's steps.

The step-wise toll (EB51, Annex 15) provides a simpler approach to calculating leakage, with less monitoring requirements and so provides project proponents with a less cumbersome method, which is likely to provide a more realistic determination of leakage.

Leakage due to displacement of pre-project agricultural activities

Subsistence agriculture was a common land-use occurring in the project area before implementation of the project; this led to degradation of the land as woody biomass in trees and shrubs was cleared for cultivation, and soil nutrients lost from expose of top soil and cultivation of unsuitable crops for the terrain. 574 ha of cropland were classified in the pre-project area.

Pre-project grazing was also present at KFP, with cattle owned by the 14 surrounding village communities. Under the project activities, no grazing will be permitted in the project area, resulting in all pre-project grazing activities being displaced out of the project boundary, consequently resulting in potential leakage due to conversion of land to grazing

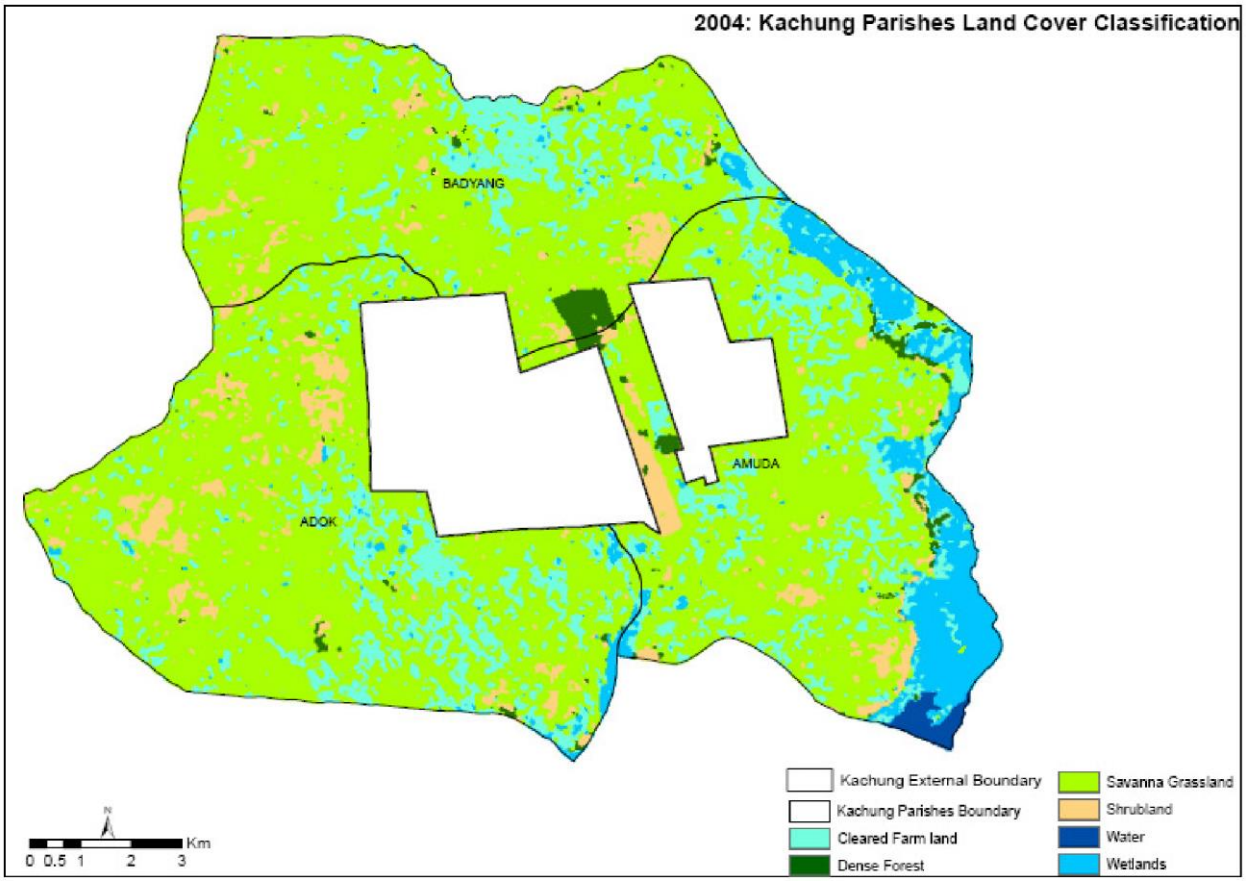
land. However, based on land classification maps and surveys analysing grazing activities prior to implementation of the project activity, it was deemed that increases in GHG emissions would be insignificant since there are large areas (larger than the project area) outside the project for displaced grazing activities to move to. The project therefore meets condition (b) (ii) of the "Guidelines on conditions under which increases in GHG emissions related to displacement of pre-project grazing activities in A/R CDM project activity is insignificant". The following test provides evidence of this:

The results from the village surveys showed that the only animals that people were grazing in the project area were cows, which is in line with what was observed by staff in the first few years of the plantation. There are large grassland areas around the reserve, shown in figure B.6.3.1, which are used by many villagers to graze their cattle, and for cultivation. This is an example of a communal area where the displaced project activities will be displaced to. The total communal grazing land outside the project reserve has been estimated to be more than the A/R CDM project area, with an estimate of 12,900 ha (savannah grassland) as shown in table B.6.3.1 – this would indicate that there are sufficient grazing areas outside the project area.

Table B.6.3.1 Total area and areas for each land class in Adok, Amuda and Badyang Parishes (as shown in figure B.6.3.1)

Class Name	Adok Parish, ha	Amuda Parish, ha	Badyang Parish, ha
Farm Land/ Bareland	1007	1006	745
Dense Forest	29	116	105
Savanna Grassland	5492	3718	3690
Shrubland	718	628	289
Water	0	80	0
Wetland	99	818	49
Total	**7345**	**6366**	**4878**

Figure B.6.3.1 Map showing examples of surrounding grassland areas



Nevertheless, results from the surveys also allowed the PPs to estimate the number of cattle that would be grazing in the project area and the carrying capacity. The procedure was as follows:

The surveys used a sampling method where three villages were randomly selected from the total number of villages surrounding the project to determine the number of cattle in the baseline; the villages were Agolowelo, Tetugo and Abenyonya B. It consisted of interviewing ten households – whether they used the project area for grazing their cattle or not - from each village with a survey designed to capture all the relevant data necessary to calculate leakage, including the average number and type of cattle that each household owns.

The results indicated a total number of cattle of 4538. The fraction of total project area sampled was based on the number of households sampled out of the total number of households from all of the surrounding villages (using the demographic data shown in Table B.6.3.2 from the District Veterinary Department (Lira Livestock Register, 1999)). This extrapolation to determine a full baseline was based on the assumption that all the other villages have similar cattle grazing numbers and activities as the sample villages. Due to common subsistence livelihoods in all of the communities this was deemed a justified assumption.

Table B.6.3.2 Number of households per village

Village	Households
Apeti A	52

Apeti B	80
Abenyonya A	92
Abenyonya B	100
Te-Amon	71
Bung	53
Agolowelo	71
Omukuceke	135
Okwor	184
Okile	90
Acuna	77
Aputi	136
Agengi	300
Te-tugo	180
Totals	**1621**

This estimate of the baseline of cattle is extremely large, especially when compared to the data collected in Lira's 1999 Livestock register (shown in table B.6.3.3), which was collected over a region larger than that of Dokolo District - back in 1999, Lira District contained 6 counties including Dokolo; in 2005, Dokolo Disrtrict was created and consequently separated from Lira District. Furthermore, the villages surrounding the Reserve are from just three of the parishes of the district. This discrepancy between the Livestock Register and sampled method may have arisen due to errors created from overestimates from participants in the questionnaires or in the assumption that all villages have similar proportions of cattle grazers. However, the number determined was clearly not realistic based on this data. The baseline number was therefore adjusted to account for the likeliness of an overestimate, with a final number – remaining conservative as based on the old district of Lira of 3000.

Table B.6.3.3 Livestock population from Lira's 1999 Livestock register

	Livestock population		
Parish	Cattle	Goats	Sheep
Adok	1278	3309	733
Amuda	906	1871	299
Bardyang	903	1629	272
Total	**3087**	**5809**	**1304**

Dr Wilson Okwir, a veterinary scientist from the District Veterinary Department, was interviewed regarding the maximum number of cows that could be displaced to *EGLs* per ha. His advice was that the grassland areas surrounding the project area have a carrying

capacity of 1 cow per ha. Therefore based on this information and on the available grazing area outside the project activity (given by figure B.6.3.1), it is conservative to assume that there will be enough grazing land outside the project area to accommodate grazing activities and thus no leakage resulting from displacement of pre-project grazing is expected.

Figure B.6.3.2 Examples of grazing areas surrounding KFP

Therefore the project uses the CDM tool from EB51, Annex 24 to estimate $LK_{Agric,t}$ solely from the displacement of cultivation activities.
Furthermore, evidence that the project meets the second applicability condition of the tool, which is, the A/R CDM project activity is not expected to cause any drainage of wetlands and peatlands due to displacement of agricultural activities, is shown in both table B.6.3.1 and figure B.6.3.1 above, where outside the project area the land available for accommodating agricultural activities (grassland) is larger than the project area.

The tool has been applied as follows:

Step 1. Estimate the area subject to pre-project agricultural activities that is expected to be afforested/reforested (therefore the activities have to be displaced) during year *t* since the start of the A/R project activity (Ad_t).

Following the tool project participants estimated the area, Ad_t, directly using a land classification of a satellite image (landsat), as shown in figure B.4.1. However, this area is deemed conservative since it also includes land which was used for agricultural purposes but was left fallow – using Landsat imagery it is difficult to differentiate between such strata.

Adt was then used to calculate the fraction of the total area subject to displacement of agricultural activities:

$$D_{t^*} = \frac{\sum_{t=1}^{t^*} Ad_t}{A}$$

Where,

D_{t^*} Fraction of the total area of A/R CDM project activity subject to displacement of agricultural activities in year *t*; dimensionless
A Total area of A/R CDM project activity; ha
Ad_t Area subject to pre-project agricultural activities that are displaced during year *t* since the start of the A/R project activity; ha
t *1, 2, 3, … t** years elapsed since the start of the A/R CDM project activity

The results of applying step 1 of the tool to the first verification period are shown below:

t	1	2	3	4	5	6	7	*t*...
Adt	0	0	0	0	574	0	0	0
A	2098.9							2098.9
Dt	0	0	0	0	0.27	0.27	0.27	0.27

Step 2. Take Δ*Ct*, annual change in carbon stock in all selected carbon pools for year *t* ; t C yr–1 calculated following requirements of the baseline and monitoring A/R CDM methodology within which this tool is used.

For the planned (*ex ante*) or actual (*ex post*) verifications calculate:

$$\Delta C_{t=t_{ver}} = \sum_{t=1}^{t_{ver}} \Delta C_t * 1year$$

Where,

Δ$Ct=t_{ver}$ Sum of annual changes in carbon stock in all selected carbon pools since the start of the A/R CDM project activity to the year of verification *tver*; t C
Δ*Ct* Annual change in carbon stock in all selected carbon pools for year *t*.
t_{ver} Year of verification event; yr

Δ$Ct=t_{ver}$ has been calculated as 22,756 tC for the planned 2012 verification.

Step 3. For each year *t* take *Dt* and select *tver* which occurs immediately after the year *t* in order to calculate:

$$\Delta Cd_{t^*} = D_{t^*} * \Delta C_{t=t_{ver}}$$

where:

ΔCd_{t^*} Sum of annual changes in carbon stock in all selected carbon pools since the start of the A/R CDM project activity to the year of verification *tver* attributable to the area subject to pre-project agricultural activities that are displaced during year *t** since the start of the A/R project activity; t C
Δ$C_{t=tver}$ the start Sum of annual changes in carbon stock in all selected carbon pools since of the A/R CDM project activity to the year of verification *tver*; t C

D_{t^*} Fraction of the total area of A/R CDM project activity subject to displacement of agricultural activities in year *t**; dimensionless

t_{ver} Year of verification event; yr

t *1, 2, 3, … t** years elapsed since the start of the A/R CDM project activity

	2006	2007	2008	2009	2010	2011	2012
ΔCd_t	0	0	0	0	22,818	22,818	22,818

Step 4. Estimate the factor *f*, as the fraction of land covered by forest (according to the national definition of forest) in the region containing the A/R CDM project activity.

This was done using a land classification of a satellite image from 2004 (figure B.6.3.1); *f* was calculated as 0.013.

Step 5. Calculate average leakage due to displacement of agricultural activities in year *t**:

$$LK_{Agric,\,t^*} = \frac{44}{12} * \frac{f}{T_{cred}} * \Delta Cd_{t^*}$$

Where,

$LK_{Agric,\,t^*}$ Leakage due to displacement of agricultural activities in year *t**; t CO_2-e

f Fraction of land covered by forest (according to the national definition of forest) in the region containing the A/R CDM project activity; dimensionless

T_{cred} Number of years contained in the first crediting period; dimensionless

ΔCd_{t^*} Sum of annual changes in carbon stock in all selected carbon pools since the start of the A/R CDM project activity to the year of verification t_{ver} attributable to the area subject to pre-project agricultural activities that are displaced during year *t* since the start of the project activity; t C

t *1, 2, 3, … t** years elapsed since the start of the A/R CDM project activity

44/12 Ratio of molecular weight of CO_2 to carbon; t CO_2-e $t\ C^{-1}$

Therefore leakage due to displacement of agricultural activities for the planned 2012 verification is as shown below:

t	1	2	3	4	5	6	7
$LK_{Agric,t}$	0	0	0	0	15	15	15

Estimation of LKfuel-wood

Project circumstances at KFP allow for the collection of fuel-wood from the A/R CDM project area but only from remaining deadwood, clearing leftovers, pruning remains, non-commercial thinnings and offcuts from harvesting. Local communities have been informed

about this arrangement and understand that no fuel-wood should be taken from any living trees. No leakage is envisaged from fuel-wood collection; activities may be more restricted in the sense that locals are unable to collect fuel-wood through destructive means, but the provisions from the project itself are expected to more than compensate for this change.

Analysis of the fuel-wood demand and project supply was carried out to gauge the impact of the project activities. The pre-project consumption of fuel-wood was estimated using data from a peer reviewed paper which looks at fuel-wood demand in the Hoima district of Uganda, west of Lira district (Buyinza and Teera, 2008). It was found that the average family surveyed collected 65 kg $week^{-1}$. This data was deemed suitable for use at KFP due to the similar land-use trends and land classes in the region of where the study took place.

Equation 50 from the methodology was not used to calculate the average pre-project annual volume of fuel-wood gathering in the project area as no sampling was required. The literature value of 65 kg $week^{-1}$ was instead scaled up to an annual volume and then divided by an average wood density of 0.55 t m^{-3} to establish the average volume of fuel-wood consumed per households per year, which was calculated as 6.15 m^3 per household per year. The total average fuel-wood consumption in the communities surrounding the project area was therefore 9,962 m^3 per year (1,621 households as demonstrated in the demographic data obtained from village population registers 2009). The subsequent step was to apply a conservative adjustment factor to this total fuel-wood consumption volume to approximate what proportion of this fuel-wood would actually be derived from the project area and what would be collected from surrounding lands. Due to the continual degradation of the project area in the baseline, fuel-wood resources have been decreasing rapidly and so this level of demand could only be met from other resources. Communities would not be solely using the Kachung Central Forest Reserve anyway as there is much land surrounding the reserve and villages of the same land class, which would also supply fuel-wood. It was therefore assumed conservative to apply an adjustment factor of 50% to the total fuel-wood consumption to estimate what would come from the project area. The average preproject annual volume of fuel-wood gathering in the project area was thus calculated as 4,981 m^3 yr^{-1}.

Table B.6.3.20 Average pre-project annual volume of fuel-wood

FG_{BL}	4,981 m^3 yr^{-1}

As explained in Section A.5.6, the project plans to minimize leakage by implementing measures to reduce any likely occurrence. Regarding leakage from fuel-wood collection, the project will supply off-cuts from pruning, non-commercial thinnnings and harvesting to the local communities to meet their energy demands. Furthermore, an efficient cooking stoves initiative is planned to be implemented in 2011, which has the potential to reduce fuel-wood demand by up to 50 % (assumed in the calculations of future fuel-wood demand). The restrictions on fuel-wood collection start in 2010 since the project proponent didn't carryout full sensitization on restriction issues pertaining to fuel-wood collection until this point in time. It is therefore assumed that fuelwood displacement only starts to take place in 2010.

Equation 51 from the methodology was used to calculate (hypothetically) the volume of fuelwood gathering that could be displaced due to the project each year if all fuel-wood from the project area was exhausted, $FG_{outside,t}$, and is shown in Table B.6.3.21 below:

Table B.6.3.21. Volume of fuel-wood gathering displaced outside project area

Year	FG_{BL}	$FG_{AR,t}$	$FG_{outside,t}$
2006	4981	4981	0
2007	4981	4981	0
2008	4981	4981	0
2009	4981	4981	0
2010	4981	0	4981
2011	2490	2598	-108
2012	2490	176	2315
2013	2490	5669	-3178
2014	2490	2874	-384
2015	2490	11967	-9477
2016	2490	12774	-10283
2017	2490	15330	-12840
2018	2490	5312	-2821
2019	2490	39067	-36576
2020	2490	25507	-23016
2021	2490	45874	-43384
2022	2490	44861	-42370
2023	2490	11184	-8693
2024	2490	14446	-11955
2025	2490	2105	385

As can be seen in Table B.6.3.21, more than half of the time the yearly supply of fuel-wood to communities goes beyond the demand - seen by the negative numbers. In these years there would be zero leakage and in the years where there is a significant surplus of supply, storage could be considered to meet future years' demand. In terms of carbon equivalents, this hypothetical leakage due to displacement from fuel-wood is shown in Table B.6.3.22, calculated using Equation 52:

Table B.6.3.22. Fuel-wood leakage

Year	$LK_{fuel-wood,t}$ (tCO_2e)
2006	0
2007	0
2008	0
2009	0
2010	5936
2011	0
2012	2758

2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0
2023	0
2024	0
2025	0
Total	8,694

Table B.6.3.22 shows that even if no fuel-wood sources were available within the project area then the total leakage due to displacement of fuel-wood collection activities outside of the project area would result in a total leakage of 8,694 tCO_2e. Following the decisions made at EB 22, Annex 15, leakage emissions from fuel-wood consumption displacement can be set as zero if $LK_{fuel\text{-}wood} < 2\%$ of actual net GHG removals by sinks. The *ex ante* estimation of net actual GHG removals by sinks is 548,530 tCO_2e, which means that this example of fuel-wood leakage would be 1.58% of actual net GHG removals by sinks, and thus, would not have to be accounted anyway. This is satisfied in this case and as such the leakage from fuel-wood collection is set as zero. It should also be mentioned that this analysis has not factored in the reduced demand of fuel-wood through the communities planting their own woodlots, which is expected to start in 2010.

Total leakage

The total leakage was calculated using Equations 27, 28 and 29:

$$LK = LK_{ActivityDisplacement}$$

$$LK_{Activitydisplacement} = LK_{conversion} + LK_{fuelwood}$$

$$LK_{conversion} = LK_{conv\text{-}graz} + LK_{conv\text{-}crop}$$

The only source of leakage was from the conversion of land to cropland with the total leakage calculated to be 7,749 tCO_2e. The timing of this leakage would be at the point at which the cropland activities were displaced – NFA issued letters back in August 2009 stating that the cultivators had to move their activities out of the Reserve by December 2009, so an activity displacement date of 2010 is used for the leakage assessment.

B.6.4. Summary of ex ante estimates of net anthropogenic removals

Year	Baseline net removals (t CO_2e)	Actual net removals (t CO_2e)	Leakage (t CO_2e)	Net anthropogenic removals (t CO_2e)	Cumulative anthropogenic removals (t CO_2e)
Year 1	0	0	0	0	0
Year 2	0	239	0	239	239
Year 3	0	2,796	0	2,796	2,796
Year 4	0	5,763	0	5,763	5,763
Year 5	0	13,792	15	13,792	13,777
Year 6	0	18,688	15	18,688	18,673
Year 7	0	42,159	15	42,159	42,143
Year 8	0	55,617	74	55,617	55,543
Year 9	0	79,738	74	79,738	79,664
Year 10	0	68,018	74	68,018	67,943
Year 11	0	63,869	74	63,869	63,795
Year 12	0	53,899	74	53,899	53,824
Year 13	0	73,961	70	73,961	73,891
Year 14	0	-20,662	70	-20,662	-20,732
Year 15	0	6,568	70	6,568	6,498
Year 16	0	-37,247	70	-37,247	-37,317
Year 17	0	-45,356	70	-45,356	-45,426
Year 18	0	30,289	129	30,289	30,160
Year 19	0	42,059	129	42,059	41,930
Year 20	0	94,339	129	94,339	94,210
Total	0	548,530	1,156	548,530	547,373
Total number of crediting years		20	20	20	20
Annual average over the crediting period		27,427	58	27,427	27,369

B.7. Monitoring plan

>> Monitoring of project boundary:

To ensure forest establishment is carried out in line with the management plan the following will be monitored:

- Site preparation: Ensure site preparation is implemented based on practice documented in section A.6.3
- Information on the number of species planted, area of stratum, and planting layout as per the management plan shall be prepared.
- Any deviation in the implementation in relation to the management or silvicultural plan and the information on such deviation shall be recorded and the justification shall be presented in the monitoring report.

Table B.7.1: Data to be used for monitoring forest establishment

ID number[43]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[44]	Recording frequency	Number of data points/Other measure of number of collected data	Comment
B1.1.1.01	Area planted	m_2	m	Years 1 – 3	100% of compartments	Following planted area SOP
B.1.1.1.02	Survival rate	%	m, c	Once after planting	Each compartment	-

Monitoring of forest management activities:

To ensure that the forest management practices described in Section A are implemented, the following parameters will be monitored:

- Planting: date, location, area, tree species, thinning intensity, volumes or biomass removed
- Thinning: date, location, area, tree species, thinning intensity, volumes or biomass removed
- Harvesting: date, location, area, tree species, volumes, or biomass removed
- Coppicing: date, location, area, tree species, volumes or biomass removed
- Fuel-wood supply from project:area, tree species, volumes
- Checking and confirming that harvested lands are re-planted as planned
- Monitoring of disturbances: date, location, area (GPS coordinates and remote sensing, as applicable), tree species, type of disturbance, biomass lost, implemented corrective measures, change in the boundary of strata and stands

[43] Please provide ID number for cross-referencing in the PDD.

[44] Please provide full reference to data source.

Table B.7.2: Monitoring variables for forest management, frequency, and how they will be archived:

ID number[45]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[46]	Recording frequency	Number of data points/ Other measure of number of collected data	Comment
B.1.1.2.01	Area of pruning	ha	c	Following pruning	100% of compartments	Filled out in compartment folders
B.1.1.2.02	Area of thinning	ha	c	Following thinning	100% of compartments	Date, location, tree species, thinning intensity and estimated volume removed should be determined and recorded.
B.1.1.2.03	Area of harvest	ha	c	Following harvest	100% of compartments	The harvested areas are stored in the GIS database and on management (silviculture) maps to determine harvesting schedule, by species. Date, location, tree species and estimated volume removed

[45] Please provide ID number for cross-referencing in the PDD.

[46] Please provide full reference to data source.

						should be determined.
B.1.1.2.04	Area replanted following harvesting	ha	c	Follo wing harve sting	100% of compartments	The area replanted will have its boundary marked out and mapped, following the original procedures for boundary delineation
B.1.1.2.05	Fuelwood supply from project	m 3	m,c	After silvic ultura l activi ty	100% of compartments	Date, location, tree species and estimated volume collected should be recorded.
B.1.1.2.06	Area affected by diseases and pest	H a	c	Follo wing diseas e outbr eak at planta tion	100% of compartments	The area will be measured and mapped. The damage will be assessed and reviewed preverification to determine which strata it should fall into.
B.1.1.2.07	Area burnt by fire	H a	c	Follo wing fire outbr eak at planta tion	100% of compartments	The area will be measured and mapped. The damage will be assessed and reviewed preverification to determine which strata it should fall into.

Information on how geographic coordinates of the project boundary are established, recorded and archived:

Monitoring of project boundary:

Parameters that need to be monitored for the boundary include

- Project ID
- Project location
- Compartment ID
- Compartment area/size

Monitoring of the project boundary will either be done using direct ground truthing in the field with a Geographical Positioning System (GPS) or using remote sensing, or a combination of both.

The boundary of the parcels of planted land will be verified using the following procedure:

For each delineated parcel, the geographic position of the boundary of where actual reforestation activity occurs will be surveyed via ground survey using GPS. Or for each delineated parcel, the geographic position of the boundary where actual reforestation activity can be seen will be delineated from remotely sensed images using GIS.

The results of ex-ante delineation will be compared to initial project boundary delineation. Any changes in this boundary will be reported to the DOE for subsequent verifications.

If the surveyed boundary falls outside of the originally delineated boundary, the eligibility of these lands will be justified and the projected baseline scenario demonstrated to be applicable. If project reforestation activities are not taking place on lands initially delineated inside the project boundaries or plantings have failed, these areas will be excluded from the project and any GHG reduction credits. The project boundaries will be modified and reported to the DOE.

The total project area will be recalculated by summing the GPS delineated parcel boundaries within GIS. The project boundary will be measured and documented in hectares. Detailed maps will be available at the DOE verification.

B.7.1. Data and parameters to be monitored

The project participants will monitor changes in carbon stocks in accordance with the approved methodology associated with the carbon stock changes in above-ground and below-ground biomass from Eucalyptus, Pine and *Maesopsis* species as described in Section A of the PDD.

These pools shall form a basis for monitoring actual net GHG removal by sinks within the project boundary. The monitoring of the actual net GHG removals by sinks includes:

- Monitoring the changes in the aboveground and belowground biomass pools of the A/R project through taking measurements from the PSPs established in each compartment.

- Monitoring of GHG emissions within the project boundary that result from the implementation of the A/R project activities such as site preparation

The project participant will confirm that the selected Biomass Expansion Factor is appropriate for the plantation by presenting a study/literature review or carrying out destructive sampling for a number of species from the region.

The data to be collected in order to monitor the verifiable changes in carbon stock in the carbon pools within the project boundary resulting from the proposed A/R CDM project activity are shown below:

Data and parameters that are available at validation:

(Copy this table for each piece of data or parameter.)

Data/Parameter	DLP, Desired level of precision (e.g. 10%)
Data unit	%
Description	± 10%
Source of data	-
Value(s) applied	-
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comment	For the purpose of QA/QC and measuring and monitoring precision control

Data/Parameter	Rj, Root-shoot ration
Data unit	Dimensionless
Description	Eucalyptus: 0.20, Pine: 0.23, *Maesopsis eminii*: 0.27
Source of data	GPG LULUCF 2003
Value(s) applied	-
Measurement methods and procedures	-
Monitoring frequency	Ounce after planting
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	CF_j Carbon fraction of species *j*
Data unit	t C (t d.m.)-2-
Description	-
Source of data	IPCC default
Value(s) applied	0.47
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	BEF, Biomass expansion factor (BEF)
Data unit	Dimensionless
Description	-
Source of data	GPG LULUCF 2003
Value(s) applied	Eucalyptus: 3.4 Pine: 1.3
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	CE, Average biomass combustion efficiency
Data unit	-
Description	-
Source of data	IPCC default value (0.5) is used if no appropriate value
Value(s) applied	0.5
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	Dj, Wood density of species j
Data unit	t d.m. m-3
Description	t d.m. m-3
Source of data	Local-derived and IPCC GPG LULUCF (see table D.1.1)
Value(s) applied	Pine: 0.51, Eucalyptus: 0.526, *Maesopsis*: 0.41
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comment	species specific value have the priority

Data/Parameter	D, Average wood density
Data unit	t d.m. m-3
Description	-
Source of data	Based on IPCC GPG LULUCF 2003
Value(s) applied	0.55
Measurement methods and procedures	Average wood density used is higher than of that for the species found in the baseline
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	zα/2, Value of the statistic z (normal probability density function), for α = 0.1 (implying a 90% confidence level)
Data unit	Dimensionless
Description	-
Source of data	Statistic book
Value(s) applied	1.645
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	PBBikt, Average proportion of biomass burnt for stratum i, stand model k, time t
Data unit	Dimensionless
Description	Measured after slash and burn
Source of data	-
Value(s) applied	Measured
Measurement methods and procedures	-
Monitoring frequency	Annually
QA/QC procedures	-
Purpose of data	-
Additional comment	Sampling survey after slash and burn

Data/Parameter	PLik, Total number of plots in stratum i, stand model k
Data unit	Dimensionless
Description	-
Source of data	Field measurement
Value(s) applied	Measured
Measurement methods and procedures	-
Monitoring frequency	5-year
QA/QC procedures	100%
Purpose of data	-
Additional comment	-

Data/Parameter	A, Total size of all strata (A), e.g. the total project area
Data unit	Hectares
Description	-
Source of data	GIS or/and GPS
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	Before the start of the project and adjusted thereafter every 5-year
QA/QC procedures	100%
Purpose of data	-
Additional comment	-

Data/Parameter	Ai, Area of each stratum
Data unit	Hectares
Description	-
Source of data	GIS or/and GPS
Value(s) applied	Measured
Measurement methods and procedures	-
Monitoring frequency	Before the start of the project and adjusted thereafter every 5-year
QA/QC procedures	100%
Purpose of data	-
Additional comment	-

Data/Parameter	*Aikt*, Area of stratum i, stand model k, at time t;
Data unit	Hectares
Description	-
Source of data	GIS or/and GPS
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	Yearly
QA/QC procedures	100%
Purpose of data	-
Additional comment	Measured for different strata and stands

Data/Parameter	AB,ikt_sb, Area of slash and burn in stratum i, stand model k, at time t
Data unit	Hectares
Description	-
Source of data	Field measurement
Value(s) applied	Measured
Measurement methods and procedures	-
Monitoring frequency	Yearly
QA/QC procedures	100%
Purpose of data	-
Additional comment	Measured for different strata and stands

Data/Parameter	AP, Sample plot area
Data unit	m2
Description	-
Source of data	Field measurement
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	5-year
QA/QC procedures	100%
Purpose of data	-
Additional comment	In accordance with that established in the monitoring plan

Data/Parameter	$B_{ijt,}$ Average above-ground biomass stock before burning for stratum *i*, species *j*, time *t*
Data unit	t d.m ha^{-1}
Description	-
Source of data	Field measurement
Value(s) applied	-
Measurement methods and procedures	-
Monitoring frequency	Before burning
QA/QC procedures	Sample plots
Purpose of data	-
Additional comment	-

Data/Parameter	DBH, Diameter at breast height of living trees
Data unit	cm
Description	-
Source of data	Plot measurement
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	5 year
QA/QC procedures	10% of plots re-measured
Purpose of data	-
Additional comment	Existing vegetation is excluded from measurement

Data/Parameter	H, Tree Height
Data unit	m
Description	-
Source of data	Plot measurement
Value(s) applied	-
Measurement methods and procedures	Measured
Monitoring frequency	5 year
QA/QC procedures	10% of plots re-measured
Purpose of data	-
Additional comment	Existing vegetation is excluded from measurement

Data/Parameter	sti, Standard deviation for each stratum i; dimensionless
Data unit	Depending on the parameter
Description	Calculations
Source of data	-
Value(s) applied	Calculated
Measurement methods and procedures	At each monitoring event
Monitoring frequency	100%
QA/QC procedures	-
Purpose of data	-
Additional comment	Used for estimating numbers of sample plots of each stratum and stand, as necessary

Table B.7.1.1 Additional QC and QA procedures: variables, uncertainty and explanation from the planned procedures to reduce such uncertainty

Data (Indicate ID number)	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
E.6.1 Plot location	Low	Random plot verification using GPS to ensure the consistent measuring and monitoring of the carbon stock change over time
E.6.2 Tree species	Low	Random Verification over the project area to ensure the area of each tree species is correctly measured
E.1.2.03 Age of plantation	Low	Random Verification over the project area to ensure the area in terms of plantation age is correctly measured
E.1.2.04 Number of trees	Low	Random plot verification
E.1.2.05 Diameter at breast height (DBH)	Low	Random plot verification
E.1.2.06 Tree height	Low	Random plot verification
E.1.2.07 Standing volume	Low	All equations used to calculate this data shall be verified
E.1.2.08 Wood density	Low	Data that divert significantly from IPCC default value shall be verified
E.1.2.09 Biomass expansion factor (BEF)	Low	Data that divert significantly from IPCC default value shall be verified
E.1.2.10 Carbon fraction	Low	Data that divert significantly from IPCC default value shall be verified

E.1.2.11 Root-shoot ratio	Low	Data that divert significantly from IPCC default value shall be verified

B.7.2. Sampling plan

>> The methodology requires uncertainty assessment and procedures to reduce uncertainties.

Quality control (QC) and quality assurance (QA) procedures to be applied to the monitoring process (Section III.11.2)

To ensure the net anthropogenic GHG removals by sinks to be measured and monitored precisely, credibly, verifiably and transparently, a quality assurance and quality control (QA/Q) procedure shall be implemented, including (1) collection of reliable field measurements; (2) verification of methods used to collect field data; (3) verification of data entry and analysis techniques; and (4) data maintenance and archiving. If after implementing the QA/QC plan it is found that the targeted precision level is not met, then additional field measurements need to be conducted until the targeted precision level is achieved.

(1) Reliable field measurements

The methodology emphasises the importance of collecting reliable field measurement data as 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 analysis. 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 the 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 all procedures 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;
- A document that shows that these steps have been followed shall be presented as a part of the project documents. The document will list all names of the field team and the project leader will certify that the team is trained
- Any new staff is adequately trained

(2) Verification of field data collection

To verify that plots have been installed and the measurements taken correctly, 10-20% of plots shall be randomly selected and re-measured independently. Key re-measurement elements include the location of plots, DBH and tree height. The re-measurement data shall be compared with the original measurement data. Any deviation between measurement and re-measurement below 5% will be considered tolerable and error above 5%. Any errors found shall be corrected and recorded. Any errors discovered should be

expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error.

(3) Verification of data entry and analysis

Reliable estimation of carbon stock in pools requires proper entry of data into the data analyses spreadsheets. To minimize the possible errors in this process, the entry of both field data and laboratory data shall be reviewed using expert judgment and, where necessary, comparison with independent data to ensure that the data are realistic. Communication between all personnel involved in measuring and analyzing data should be used to resolve any apparent anomalies before the final analysis of the monitoring data is completed. If there are any problems with the monitoring plot data that cannot be resolved, the plot should not be used in the analysis.

(4) Data maintenance and archiving

Because of the long-term nature of the A/R CDM project activity, data shall be archived and maintained safely. Data archiving shall take both electronic and paper forms, and copies of all data shall be provided to each project participant. All electronic data and reports shall also be copied on durable media such as CDs and copies of the CDs are stored in multiple locations. The archives shall include:

- Copies of all original field measurement data, laboratory data, data analysis spreadsheet;
- Estimates of the carbon stock changes and non-CO2 GHG and corresponding calculation spreadsheets;
- GIS products;
- Copies of the measuring and monitoring reports.

Sampling design and stratification

Ex-post stratification of the planted area will occur at the time of the first verification event, and subsequently prior to proceeding verification events. Ex-post stratification will take into account year of planting, tree species, forest management activities/stand development, site index and catastrophic events such as disease outbreak and fire.

Permanent sample plots (PSPs) are used for sampling over time to measure and monitor changes in carbon stocks of the relevant carbon pools in each compartment. The plots are treated in the same way as other lands within the compartment and stratum e.g. in terms of site preparation, weeding, pruning, thinning, harvesting, etc. Once ex-post stratification has been carried out, the number of PSPs required will be calculated. The ex-post stratification will be carried out in GIS and allow for the area of each stratum to be calculated. Equations 57 and 61 from AR-AM0004 version 4 have been used to calculate number of PSPs required per stratum to achieve a targeted precision level for biomass estimation within each stratum of ± 10% of the mean at a confidence level of 90 % (using parameters derived from existing plantation data from the region). The project participants anticipate using circular shaped PSPs of plot size between 200-400 m2. For the PSP sample size calculations, an estimate of the biomass (Q) at the first verification event, scheduled for 2012, was determined using the yield model timber volumes, BEFs and root-to-shoot ratio for each of the species. The standard deviation was assumed to be 30% of the mean – this was assumed to be a conservative value based on PSPs implemented at other GRAS projects.

The plots will be systematically located with a random start in each stratum or sub-stratum following the GRAS Standard Operating Procedure (SOP) for a generation of PSP coordinates. See Table B.7.2 for calculated number of PSPs and Figure B.7.1.

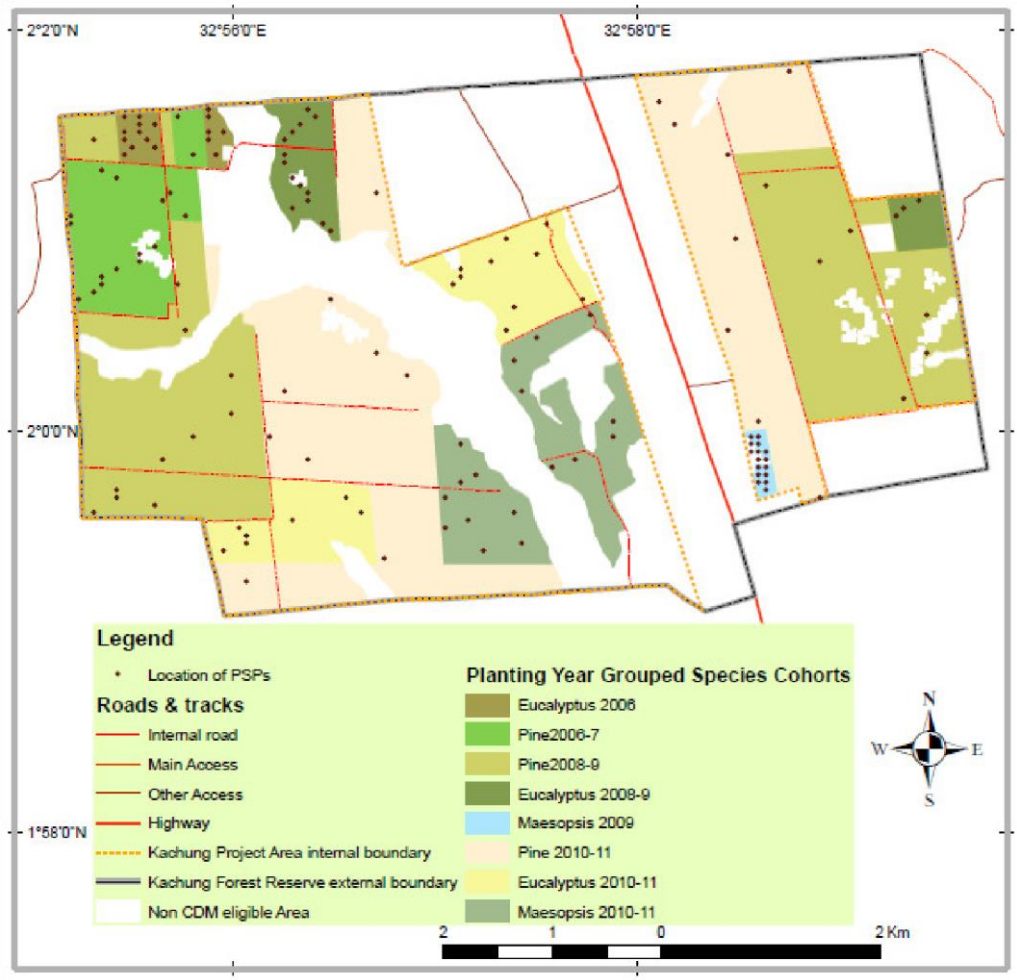
The plots will be marked on the ground by an inconspicuous centre pole marking the centre of the plot. Trees will also be tagged in a way so that they are not clearly visible: unique number tags will be assigned on all trees inside the plot but towards the bottom of the trunk and only a spot will be marked at the breast height level (1.3m) on the inside of the tree facing the centre point, so that the same point is measured all the time during measurement. The number of each tree will be written using oily paint on aluminium covers to allow keeping the information concerning the tree and easy for cross-referencing.

Table B.7.2. Ex ante calculation of number of PSPs (based on 400 m2 PSPs)

	Cohorts		
Species	2006-2007	2008-2009	2010-2011
Pine	17	17	17
Eucalyptus	17	17	17
Maesopsis	-	16	17
Totals	34	50	51

	2012 (R)	2017	Sum
e06	6	0	6
e08	12	0	12
e10	6	0	6
e11	3	0	3
e12	0	6	6
e13	0	5	5
p06	7	0	7
p07	22	0	22
p08	26	0	26
p09	25	0	25
p10	0	70	70
p11	0	36	36
p12	0	8	8
p13	0	2	2
Sum	107	127	234

Figure B.7.1. Map showing location of PSPs



B.7.3. Other elements of monitoring plan

>> The baseline carbon stock changes do not need to be monitored after the project is established because the accepted baseline approach 22(a) assumes continuation of existing changes in carbon pools within the project boundary from the time of project validation. However, as a renewable crediting period has been selected for the A/R CDM project, relevant data as specified in AR-AM0004 will be collected and archived to determine whether the baseline approach and baseline scenario are still valid or have to be updated.

The carbon stock changes in the baseline scenario will be estimated by measuring the carbon stock in the above-ground biomass on control plots respectively at the initial stage and at the end of the crediting period – the biomass at the initial stage of the control plots is the same as that calculated from the baseline sample plots for the cropland stratum inside the A/R project area as the control plots as located on cropland. The control plots have been located outside of the project boundary and thus are not in control of the project proponents. Furthermore, the control plots are “silent” in respect that there is no evidence, other than GPS points which have been taken, to show that these areas of land will be monitored periodically when the baseline is subject for renewal. The control plots will be monitored at the end of the first crediting period to determine the baseline of the degraded lands in the renewed crediting period.

Table E.3.1 Location of control plots

Control Plot	Location (Extra GPS positions)
I	36N 0498358; 0224497
II	36N 0498576; 0224511
III	36N 0499236; 0222365
IV	36N 0491057; 0223191
V	36N 0492481; 0219414

Data and parameters that are monitored:

Data/Parameter	National, local and sectoral policies that may influence land use in the absence of the proposed A/R CDM project activity
Data unit	-
Description	N/A
Source of data	Various
Value(s) applied	-
Measurement methods and procedures	Collected
Monitoring frequency	Start and end of the crediting period
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	Natural and anthropogenic factors influencing land use, land cover and natural regeneration
Data unit	-
Description	N/A
Source of data	Various
Value(s) applied	-
Measurement methods and procedures	Collected
Monitoring frequency	Start and end of the crediting period
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	Stratum ID
Data unit	Alpha numeric
Description	-
Source of data	Stratification map
Value(s) applied	-
Measurement methods and procedures	Collected
Monitoring frequency	20 years
QA/QC procedures	-
Purpose of data	-
Additional comment	Stratum identification for baseline scenario checking

Data/Parameter	Carbon stock in above-ground biomass at the end of the crediting period
Data unit	tCO_2-e yr^{-1}
Description	-
Source of data	Calculated based on baseline plot measurement
Value(s) applied	-
Measurement methods and procedures	Collected
Monitoring frequency	End of the crediting period
QA/QC procedures	-
Purpose of data	-
Additional comment	Calculated based on baseline plot measurement for different strata/sub-strata

Data/Parameter	Carbon stock in above-ground biomass at the start of the crediting period
Data unit	tCO_2-e yr^{-1}
Description	-
Source of data	Calculated based on baseline plot measurement
Value(s) applied	-
Measurement methods and procedures	Collected
Monitoring frequency	Start of the crediting period
QA/QC procedures	-
Purpose of data	-
Additional comment	Calculated based on baseline plot measurement for different strata/sub-strata

Data/Parameter	Baseline carbon stock change in above-ground biomass
Data unit	tCO_2-e yr^{-1}
Description	-
Source of data	Calculated based on baseline plot measurement
Value(s) applied	-
Measurement methods and procedures	Collected
Monitoring frequency	20 years
QA/QC procedures	-
Purpose of data	-
Additional comment	Calculated based on baseline plot measurement for different strata/sub-strata

B.7.3.1 Proposed measures to be implemented to minimize potential leakage

Potential leakage is anticipated from the displacement of grazing, cropland and fuel-wood/ charcoal production activities, which were all taking place pre-project, albeit illegally within the forest reserve. It is a key objective of KFP to foster socio-economic development in adjacent communities by providing employment opportunities, by promoting diversified sources of income and by introducing more sustainable land-use practices. The project seeks to avoid the negative climate and community impacts of activity displacement through a mitigation programme that includes increasing the amount of services provided in adjacent communities, thus minimizing any potential leakage.

Many of the community members currently practice shifting cultivation. In total, 574 ha of cropland were mapped in the reserve area (pre-project) under the control of LFC, both in the plantable and wetlands conservation areas. Although the wetland areas will not be planted, and are thus outside the CDM project boundary, the croplands will still be displaced due to the condition of the license granted to LFC from NFA, which stipulates that the only activity that can take place is tree planting. The cropland areas within the wetlands will therefore be included as displaced activities, and hence included in the leakage calculations.

Fuel-wood and charcoal production is common practice for the communities surrounding the project and it's not surprising that many of the community dwellers venture into KFP to obtain these everyday necessities. KFP, under the prohibited activities in forest reserves as stipulated in the National Forestry and Tree Planting Act, will not allow people to collect fuel-wood for commercial purposes or to produce charcoal within the reserve. However, local communities can continue to access the project area to collect fuel-wood for personal use, thus no leakage is foreseen from displacement of these activities. The communities have been sensitized regarding collection of biomass from only dead trees and of that supplied from the project: vegetation cleared for land preparation, pruning remnants, non-commercial thinnings and off-cuts.

Interviews with local community members showed that many people owned cows which were grazing on and off in the project area – the maximum number of cows owned being 11. Although goats and sheep have been seen in the villages surrounding the project, the sample of interviewees that participated in the leakage survey showed that no sheep or goats graze in the project area, only cows.

Leakage prevention measures will be implemented to abate the magnitude of these leaked emissions from displaced activities. These include:

- Provision of fuel-wood from thinnings (first pine and maesopsis thinnings at year 4), prunings, offcuts from later thinnings and harvestings
- Implementation of an efficient cooking stoves programme for local communities, with the objective of reducing fuel-wood demand;
- Promotion of improved land management practices;
- Promotion of tree-planting through community woodlots, which will produce fuelwood and charcoal-making in areas surrounding the project area;
- Alternative livelihood programmes such as improved agricultural techniques

Table B.7.3.1 shows a sample of the amount of fuel-wood that will be supplied through the non-commercial thinnings of pine and *maesopsis* that take place after 5 years.

Table B.7.3.1 Pine and Maesopsis non-commercial thinnings supplied as fuel-wood

Year	Fuel-wood supply from Pine thinnings, m^3
2011	38
2012	334
2013	600
2014	949
2015	1,204
2016	627

Year	Fuel-wood supply from *Maesopsis* thinnings, m^3
2011	2,578
2012	0
2013	5,346
2014	2,105
2015	8,720
2016	2,578

In addition to the non-commercial thinnings, offcuts from harvests and thinnings (the left over woody biomass of the crown and branches when the trunk is being removed) and pruning will be supplied to communities as fuel-wood. Offcuts will be produced from all three tree species being planted in the A/R CDM project. Remnants of biomass from pruning will be provided as another supplementary fuel-wood supply.

Measures to minimize leakage from the displacement of cropland activities will be implemented by LFC through providing assistance in the establishment of agroforestry and improved agricultural practices on farmers' lands through education and workshops with agricultural extension workers. The increased yield and market value of these crops along with more greatly maintained soil fertility of such practices will reduce the need for additional farming lands.

Communities will establish woodlots on their farms from seedlings, which will be supplied from the KFP nursery. This is an important community development initiative that GRAS encourages at all its plantations and is often very successful due to a large number of the community people learning plantation management skills through their work experience with the company. This type of initiative also encourages knowledge transfer to others who want to be involved with community woodlots but haven't been formally educated on forestry. Moreover, development of community woodlots provides a source of fuel-wood, wind breaks, poles, and timber and soil maintenance for the local communities. Food crop production can also increase as a result improved farming conditions due to the increased fertility of community soils.

Involvement and support of all adjacent communities will contribute to project success and protection of the established plantations, which is why community interests and needs are so important in integrating into project planning and implementation. In addition to stakeholder consultations during the EIA and the ecological assessment, a permanent Community Development Officer was recruited by the company to coordinate all necessary

analysis, documentation, communication and training for a successfully functioning community programme of KFP. Authorized activities, such as deadwood collection are managed and coordinated by the Community Development Officer, ensuring that they do not exceed sustainable levels.

B.7.3.2 Procedures for the periodic review of implementation of activities and measures to minimize leakage

As described in section B.7.3.1, project activities to minimize leakage include supply of fuelwood to local communities through non-commercial thinnings, prunings and harvesting offcuts; implementation of an efficient cooking stoves initiative which will reduce the demand of fuel-wood; promotion of community woodlots; and alternative livelihood programmes such as improved agricultural techniques.

The periodic review of implementation of such activities will be coordinated through the Community Development Officer (CDO) who will be working closely with the local communities. The CDO will disseminate information to the local communities when fuelwood can be collected from the plantation and also inform the management when communities' demands have been met (by monitoring biomass needs) so that storage of excess fuel-wood can be arranged. The CDO will also monitor the lands which have been identified to accommodate the displaced grazing and cultivating activities. If the situation on these lands change and activities are no longer able to be sustained, then initiatives will be implemented to counteract.

B.7.3.3 Operational and management structure(s) that the project proponents will implement in order to monitor actual net GHG removals by sinks and any leakage generated by the proposed A/R CDM project activity

The proposed A/R CDM project activity will be implemented under the following operational and management structure:

- This proposed A/R CDM project activity has been developed by Busoga Forestry Company (BFC), a sister company in Uganda of Green Resources AS, whom is providing primary finance for the project. The project will be implemented by LFC and managed by BFC and LFC concurrently. BFC is wholly owned by Green Resources AS from Norway, who is the majority shareholder of LFC, holding 73% of shares. The remaining shares are held by LFC (10%) and Private Shareholders (17%).

- The Project Management Officers that are established under BFC and LFC will be responsible for coordinating the project participants and providing technical services. This includes arranging training for the planting entities and farmers/communities involved, supervising the implementation of the proposed A/R CDM project activity, as well as organizing a technical support panel (TSP) to carry out the monitoring of the project implementation performance and impacts. This includes measuring and monitoring of the actual GHG removals by sinks and any leakage generated by the proposed A/R CDM project activity. The relevant information and data will be documented and archived by the Project Management Officers and project entities in both electronic and paper copy.

- The Green Resource Inventory and Monitoring team will take the lead for the measuring and monitoring of the actual GHG removals by sinks and any leakage generated by the proposed A/R CDM project activity. They will closely work with country PMOs and the project entities by providing technical guidance on the monitoring process; jointly carry out the field measurement and necessary surveys, as well as the data collection and analysis. The project entities will be responsible for the requested routine measurement, data collection and documentation filing according to the project monitoring plan.

- The Makerere University Faculty of Forestry & Nature Conservation and Green Resources management experts will provide technical consultation and training to BFC & LFC technicians and the project entity staff in the measuring and monitoring of the actual GHG removals by sinks and leakage generated by the proposed A/R CDM project activity. FFNC will also verify field data and data entry and analysis, as well as provide guidance for drafting project monitoring report.

- The Kachung Plantation Project Entity will be responsible for the implementation of project reforestation activities, forest management and maintenance, forest harvesting and regeneration, as well as the carbon credit trade process. The Entity will also be responsible for day to day project monitoring and providing training to local communities and farmers on plantation management technologies by closely working with the sub-county of Agwata. In addition, the Entity will be responsible for drafting the project progress and monitoring reports under the guidance of expert teams.

The following staff members from Green Resources AS, BFC and LFC are responsible for applying the monitoring plan:

Table B.7.3.3.1: Names of persons applying the monitoring plan for Kachung Forest Project

Name of Person	Entity	Contact Information (email)	Project participant listed in Annex 1
Ms. Emma Shepherd-Walwyn	Green Resources AS	emma.shepheard-walwyn@greenresources.no	Yes
Mr. Hampus Hamilton	Green Resources AS	hampus.hamilton@greenresources.no	No
Mr. John Ferguson	Busoga Forestry Company Ltd	john.ferguson@greenresources.no	Yes
Ms. Edith Ayikoru	Busoga Forestry Company Ltd	edith.ayikoru@greenresources.no	No
Mr. Kizza Simon	Busoga Forestry Company Ltd	kizza.simon@greenresources.no	No
Ms. Oweta Miriam	Busoga Forestry Company Ltd	miriam.oweta@greenresources.no	No

Ms. Bulyaba Winnie	Busoga Forestry Company Ltd	winnie.bulyaba@greenresources.no	No

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>> 01/10/2006

C.2. Expected operational lifetime of project activity

>> 60 years (3*20 year) and 0 months. However, the forest project is envisaged to have a sustainable lifetime, thus extending beyond this period.

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>> Renewable crediting period type - First crediting period

C.3.2. Start date of crediting period

>> 01/10/2006

C.3.3. Duration of crediting period

>>20 years and 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>> It is a legal requirement of the Government of Uganda that an EIA be conducted for proposed activities that are likely to have significant impacts on the environment. The National Environment Act is the legislative tool and imposes a mandatory duty on a project developer to carry out the EIA. The National Environment Management Authority (NEMA) provides EIA requirement guidelines for project developers and is also the government body which approves proposed activities. BFC/ LFC therefore conducted an EIA to gauge the impacts of the proposed KFP activities and to receive approval from NEMA. The EIA was carried out in accordance with the NEMA guidelines and EIA guidelines assessing impacts on biodiversity and natural ecosystems based on meetings, interviews with key stakeholders,

community consultations and field surveys. The EIA was further complemented by an independent Ecological Assessment, both of which, along with the approval letter, will be made available as supporting information to the DOE as required.

The main points highlighted from the EIA and Ecological Survey relating to environmental impacts are as follows:

Fire risk
Fires are a threat to all forest plantations, and as annual grass fires in the region by cattle owners and hunters have been reported, according to the EIA, KFP will implement a full set of measures to mitigate such risk. As described in Section A.5.3., measures including the establishment of fire towers – one in the eastern and one in the western block - used for detection of fire; a standby fire crew during the main dry season and a general patrol team trained in fire measures all year round to take care of any occurrence of fire within or outside project boundaries; and fire lines in place to stop the spread of fire into, out of and within the plantation. Internal fire lines around planted areas are 6 m wide whereas the external fire line around the edge of the property is 6-10 m.

Hydrology
Negative impacts to hydrology could potentially arise from two aspects of the project: firstly, the use of fast-growing exotic species, such as Eucalyptus, could affect the local water resources due to the species known characteristic of having deep roots that without sustainable management can deplete water resources; also, the project's use of chemicals such as fertilizer, herbicide and pesticide means that there is a risk of contamination of the water resources if such chemicals aren't handled correctly. The project will mitigate such risks through conserving buffer zones – areas which are not planted - of 60m (30m each side) around all wetland areas within the project. Furthermore, of the total project area, just a minor proportion of Eucalyptus is planned to be planted, less than 20%. The contamination risks will be reduced by the project only using chemicals, which have been approved by NEMA and FSC. KFP is also being developed to achieve FSC certification so management procedures will be in place to monitor the use of different types of fertilizers. Monitoring of water quality will take place through both visual monitoring and assessment of water samples to gauge the impact of the project on the local water resources.

Soils
Project infrastructure could potentially lead to soil erosion if roads are not planned along the contours and with good drainage channels. Such project risks will be mitigated through developing and maintaining such a well planned road system.

Pests and diseases
Pests and diseases are not likely to be a big threat given that the tree species selected for the project have not yet significantly suffered from massive pests and disease attacks in Uganda although Eucalyptus species is under threat from the *Chalcid wasp* disease. The aphid attack in Pines and Cyprus which concentrated in western Uganda has not spread much and indications are that the infestation is declining.

Other impacts that have been raised in the EIA and Ecological Suvery are as follows:

- Carbon sequestration – sequestration of carbon dioxide from the atmosphere will help mitigate climate change
- Reduced pressure on woodland – provisions of fuel-wood from KFP will help communities meet their energy demands

- Impacts associated with nursery operations – pollution risk of fertilizers to local water sources and polythene tube being properly disposed of
- Importance of protecting seasonal streams from erosion and maintaining biodiversity
- Land-cover change from grass and shrubland to predominantly exotic plantation

D.2. Environmental impact assessment

>> The EIA was carried out by independent consultants from Enviro – Safety Consults Limited in accordance with the Ugandan government regulations and NEMA guidelines at the time of the assessment. The conclusions from the assessment are presented in section F.1, including all negative impacts.

The references to supporting documents are listed as follows:

1. Environmental and Socio-Economic Impact Statement Report for the proposed A/R–CDM project activities, Kachung Central Forest Reserve by Kachung Plantation Project, prepared by Enviro-Safety Consults Limited, March 2008

2. Certificate of Approval of Environment Impact Assessment for the titled project Proposed Clean Development Mechanism Afforestation and Reforestation Project, certificate No. NEMA/EIA/1746 and signed by the Executive Director of NEMA

SECTION E. Socio-economic impacts

E.1. Analysis of socio-economic impacts

>> A socio-economic assessment was carried out as part of the government required environmental impact assessment. This was done independently following a protocol laid out by the National Environment Management Authority (NEMA) under the Ministry of Water and Environment. The SEIA was approved by NEMA – the certificate will be provided on request to the DOE – although BFC felt that the socio-economic impacts required more of an in-depth understanding. As such, BFC commissioned a further study to be carried out by a multi-disciplinary team of experts from Makerere University which covered both ecological and social aspects of the project in greater detail, with a particular focus on any potential negative impacts, and strategies for mitigation. This is referred to as the Ecological Survey.

To assess the socio-economic impacts of the project the Makerere team employed a multidimensional, consultative and participatory approach. Their 'third party' independent status gave them a strong position in which to carry out an objective assessment, especially when talking to local communities and other stakeholders.

This approach included collection of new data from field studies in the sampled plots, participatory interviews, key informant interviews, and focus group discussions. Local government staff responsible for natural resources both at the district and sub-county levels, Community-Based Organisations (CBOs), as well as local communities, academia, researchers and the private sector were all consulted. The Participatory approaches involved all stakeholders in the area in order to capture their opinions and a combination of qualitative and quantitative data collection methods were used. Information on socioeconomic characteristics was collected using a systematic approach. A combination of key informants and snow balling sampling techniques were used to identify resource users and particularly knowledgeable local people. Some of these people took part in group

discussions and ten of them were incorporated into the teams that conducted ecological survey in the reserve. The methods included literature review, consultations, in-forest resource inventory, as well as a socio-economic survey as detailed below.

When assessing the socio-economic impact of KFP, it is important to bear in mind that the land has been designated for reforestation by the NFA as part of its nationwide policy to designate areas for the promotion of commercial reforestation. Some of the initial negative impacts caused to the community in relation to designation of the land by NFA for forestry and communication were beyond the control of the project developer. The NFA have by law zoned the area for forestry and prohibited agriculture; as part of the granting of the license for the land BFC is required to enforce the law in relation to land use. LFC has now made every effort to remedy early misunderstandings in relation to the project.

Background to socio-economic conditions in the KFP and surrounding area

KFP is located in Agwata sub-county, in the parishes of Adok, Bardyang and Amuda. Historically, the inhabitants of Agwata are Langi by tribe and believed to have moved in the general migration of Nilo-Hamite between 1800-1890 and settled in the present location where they took up agrarian life. In 2002 the population of Agwata was approximately 27,900, with a near fifty-fifty ratio of males to females and an average household size of 5.147. Similar male-to-female ratios were seen in Adok, Bardyang and Amuda, as well as average household sizes. Surrounding KFP are 14 villages and all lie within close proximity to the boundary. These villages are Okile, Agengi, Acuna, Agolowelo, Tetugo, Okwor, Omukuceke, Bung, Teamon, Abenyonya A, Abenyonga B, Apeti A, Apeti B and Aputi villages, as shown in Figure A.2.1.3.1. The total estimated population in the 14 villages surrounding KFP is approximately 6,000 people.

The main socioeconomic activities in these villages are subsistence agriculture and fishing. The communities in Agwata sub-county are predominantly subsistence farmers and like many other sub counties, pulses (beans, pigeon peas, taper beans, grams, groundnuts), root crops (cassava, sweet potato), cereals (millet, maize, sorghum, rice) and oil crops (simsim, sunflower, soybeans) are the chief crops grown. Cotton remains a key traditional commercial crop in the district with the cash crop tobacco and increasingly shea butter grown. Sunflower has emerged as one of the non-traditional cash crops. The following crops double for both food security and income generation: simsim, cassava, maize, rice, sorghum and soybeans. Table E.1.1 below indicates the source of livelihood by area across Dokolo district and clearly indicates that subsistence farming is prevalent.

Table E.1.1. Source of livelihood for total population of Dokolo district

Source of Livelihood	**Total people**	**Percentage of Dokolo population**
Subsistence Farming	102,085	78.9
Earned Income	16,690	12.9
Property Income	1,213	0.8
Others	11,333	7.4
Total	**129,385**	**100**

Poverty is the main underlying cause of poor health in Dokolo District. Associated factors are low level of literacy especially among women, high prevalence of preventable diseases,

[47] Uganda Population and Housing Census 2002, as referred in the EIA

emergence of diseases of lifestyles, inadequate provision and inequitable distribution of health services and other social services, e.g. safe water supply and sanitation facilities. These problems are also widespread in Adok, Bardyang and Amuda and in the surrounding communities of the project. Access to health services still remains poor in Dokolo district as a whole. Over 42% of the population still moves over a distance of 5kms in search of health services. There is only one Health centre IV, two health centre III and 4 health centre II. Despite government efforts to fully immunize the population against killer diseases, coverage is still poor.

Negative Socio-Economic Impacts:

Reduced Land Available for Community Activities:

In the years directly before KFP started to implement its activities the local community took advantage of relaxed enforcement of forest law and regulations, during the transition from Forest Department to NFA (discussed in section B.5), to cultivate more land within the forest to satisfy their subsistence and cash needs. This has lead to a degradation of the KFP over time (see section B.5) and a reduction in biodiversity. The local communities recognize themselves that some regulation on use of resources in the reserve is useful to avoid the 'tragedy of the commons', ensure protection of the resources, and en sustainability over time.

Since the start of the project, local communities have been discouraged by KFP from practising illegal activities within the reserve, such as cultivating and grazing activities that were taking place. However, this had little effect on deterring community members from using the area. In August 2009, NFA issued letters to all communities surrounding the Reserve, telling them that by the 1st December 2009 all illegal activities within the Reserve must stop – the 1st December 2009 was therefore used as the date for which activities were displaced, and thus as the leakage start date). This meant that villagers using KFP were allowed to finish harvest of crops from their existing agricultural activities before being moved on.

Although the woodland is being converted to plantation forest, it was indicated during the PRAs of the Ecological Survey that local communities still wanted to be part of the resource users and to have access to some of the resources within the woodland/reserve. To meet this request provisions have been made for grazers so that they can still access watering points within the KFP, most notably accessing the large wetland area in the centre of KFP. To reduce the impact of prohibiting access to forest areas for fuel collection and charcoal production BFC will provide local communities with woody biomass offcuts (branches, tree top etc) from pruning, thinning and harvesting and non-commercial thinnings. Although the local communities have expressed interest in accessing the resources within the woodlands, they themselves suggested that tree cutting/harvesting should be regulated and people should be stopped from ring barking and killing bigger trees, some of which are seed sources or nesting places for birds. This will help to promote regeneration and conservation of the woodlands and biodiversity in the forest reserve. KFP have implemented this through prohibition of wood biomass extraction from the natural forest in the KFP.

The Ecological Survey resulted in Table E.1.2 being put together which shows constraints and conflicts over natural resource management and ways of resolving them.

Table E.1.2: Constraints, Conflicts and Management Options for KFP Resources

Natural resources	Constraints and conflicts	Mechanism to resolve the conflict
Water resources (lakes, swamps, rivers, wells and springs)	○ Restrictive policies on the use of some these resources ○ Illegal fishing activities ○ Inadequate staffing and facilitation ○ Ignorance of the law ○ Lack of cooperation on resources use ○ Poor sanitation at the landing sites ○ Silting of the water bodies	○ Planting grass strips to stop silting of water bodies ○ Enforcing laws and bylaws ○ Sensitization of the people ○ Formation of Beach Management Units (BMUs).
Forests and woodlands	○ Illegal activities (encroachment and harvesting) ○ Unclear boundary/demarcation of gazetted areas ○ Inadequate staffing and facilitation ○ Lack of cooperation by the local communities	○ NFA has come in to stop illegal activities ○ District policies have already been developed regarding local management of these resources ○ KFP, NGOs and CBO are sensitizing people and encouraging them to plant trees
Land resources (sand, clays, stones)	○ Ignorance about land adjudication ○ Very few lands have been surveyed and demarcated ○ Increasing land degradation ○ Soil infertility ○ High population pressure on land resources ○ Ignorance of the Land Act ○ Insecurity of land tenure	○ District land board tribunal is helping in settlement of some disputes ○ Land Acts stipulates how land is acquired and used ○ Sensitization of farmers about land and soil fertility decline by CBOs, NGOs and local governments ○ Family planning to
		check on the population pressure on the land.

Since the Ecological Survey was conducted, BFC has hired a Community Development Officer (CDO) who lives locally and visits the communities around the village frequently (he is visiting the villages every week) The presence of the CDO has dramatically improved relations with the communities as communication has improved over the KFP project, and speculation and rumours reduced. BFC has now developed a Community Development Plan which has a clear plan, and budget laid out which is allocated for providing benefits to local communities.

Positive Socio-Economic Benefits from implementation of KFP

Employment

The A/R CDM project activity at KFP employs 12 professional staff, 53 group employees and 264 casual workers (note that the number of casual workers fluctuates depending on the season). Most of these jobs are in the nursery, planting and other silvicultural operations. It is the policy of the project participant that 90% or more of the required labour force of the project come from the surrounding communities.

The presence of the project will ensure the transfer of plantation management knowledge to the surrounding communities who make up the majority of the labour force. Training and knowledge on nursery management, silviculture, diseases and pest control, fire fighting and harvesting techniques will be provided to workers. They will be able to use the skills they learn not only in the KFP, but also to help manage their own woodlots.

Economic stimulus for the area and nation

It is anticipated employment gains to local community and increase in income will give rise to more economic activities and create more sources of income in the areas, thus improving the overall standard of living of the people. Beyond the local community level, the project activity will contribute to the national economy through taxes, levies and royalties as well as the overall transfer of forest related technologies. Investment in KFP is likely to strengthen further development of trade opportunities, increasing the incomes of traders in and around Dokolo and the adjoining areas such as Lira Municipality.

Supply of Sustainable Timber

KFP will contribute to the housing sector and urbanization. Indeed, at the end of the project rotation, it is expected that timber and poles will be harvested contributing to the wood products market and economy of Uganda. If well developed, KFP can be an accessible source of timber and wood for construction purposes. This will reduce pressure on native forests, and hopefully reduce deforestation in Uganda.

HIV Programme

HIV/AIDS control and prevention is a new project component started in July 2009 - initiated by BFC in partnership with the Uganda NGO Foundation for Integrated Rural Development (FIRD) - among its workers in KFP. The programme has been funded by NORAD, and facilitated through BFC.

This project is expected to improve health, quality of life and working capacity of the company employees. The specific objective of the project is to improve the level of HIV/AIDS awareness and positive living among project employees and their family members; improve access of Anti Retroviral Drug (ARD) to HIV/AIDs infected employees and provide psycho-social support to HIV/AIDS infected and affected employees and their families. FIRD used the funds to implement baseline survey, radio talk show, production of Information Education and Communication materials, procurement of Insecticide treated mosquito nets, holding workshop for Village Health Teams and BFC workers. FIRD hopes to accomplish full implementation of the remaining project activities such as procurement and distribution of bicycles, condoms, nutrition education, conducting village health meetings, final evaluation and audit by December 2009 when the balances of 35% of the project funds are released.

Table E.1.3 Other community benefit programmes implemented by BFC at KFP

Sector	Activity	Implementation Status
Health	Construction of Dispensary	Construction of bricks – site location still under review
Water and Sanitation	Protection of Springs	4 springs protected
	Rehabilitation of boreholes	1 rehabilitated, 4 others to be renovated in 2010 -ongoing activity
	Drilling of Shallow Wells	Budgeted for 2010 in Agolowelo
	Water testing and treatment	To be carried out once protection and rehabilitation of water points are complete
Community Forestry	Provision of Seedlings to Communities	To be implemented with the first rains of 2010. 348 people are registered for tree planting
		and ~150,000 seedlings have been budgeted for this
Agro forestry and Energy Efficiency	Training and materials for building and operation of Clean Cook Stoves	2011 budget
	Formation of Farmer Groups for : Apiary, Fish Farming, Poultry and Dairy Farming	2011 budget – concept paper developed
Technical Support	Community training in tree planting and silviculture	Provided once seedlings have been given out
Culture	Protection of cultural and important sites as shown in Table E.1.3 below	We have designed posts with inscription “this is a site of special importance” and placed them in all the 16 sites identified the ecological survey report.

Table E.1.4 Existing important sites reported by the community

S/No	Resource/Place	Location (Extra GPS positions)
1	Borassus aethiopium stands	36N 0492853; 0222802; El 1054m; Acc 08m
2	Spring	36N 0492503; 0223887; El 1064m; Acc 07m

3	Water point for livestock (Wetland/swamp point 1)	36N 0492 517; 0223890; El 1063m; Acc 08m
4	Cattle way from Apeti to water source	36N 0492395; 0223616; El 1062m; Acc 07m
5	Wetland (swamp) point 2	36N 0492399; 0223532; El 1057m; Acc 07m
6	Wetland (swamp) point 3	36N 0492411; 0223392; El 1059m; Acc 08m
7	Cattle track to water source point 2	036N 0492382; 0223436; El 1059m; Acc 07m
8	Area where guinea fowl were found	36N 0492275; 0223182; El 1063m; Acc 07m
9	Breeding place for hornbill 1	036N 0492267; 0223175; El 1062m; Acc 08m
10	Breeding place for hornbill 2	36N 0492233; 0223095; El 1066m; Acc 07m
11	Sand mining point	36N 0492367; 0223110; El 1061m; Acc 08m
12	Salt lick	36N 0492475; 0222981; El 1057m, Acc 07m
13	Fishing area (Swamp/wetland) point 4	36N 0492853; 0222802; El 1054m; Acc 08m
14	Vitellaria paradoxa stands	36N 0494150; 0220864; El 1061m; Acc 08m
	Cultural worship place	36N 0493921; 0222075; El 1053m; Acc 08m

E.2. Socio-economic impact assessment

>> The project participants contracted an independent agency to carry out the SocioEconomic Impact Assessment, namely 'Enviro-Safety Consults' in accordance with the regulations of the Ugandan government. A letter of approval demonstrating the acceptance by NEMA of the quality and contents of the EIA/SEIA will be made available to the DOE as additional supporting documents on request. The conclusions from the assessment are presented in section E.1, including negative impacts.

The references to supporting documents are listed as follows:

1. Environmental and Socio-Economic Impact Statement Report for the proposed A/R–CDM project activities, Kachung Central Forest Reserve by Kachung Plantation Project, prepared by Enviro-Safety Consults Limited, March 2008
2. Certificate of Approval of Environment Impact Assessment for the titled project Proposed Clean Development Mechanism Afforestation and Reforestation,

Project, certificate No. NEMA/EIA/1746 and signed by the Executive Director of NEMA

Similarly to monitoring environmental aspects of the A/R CDM project, GRAS is developing a monitoring plan to cover socio-economic aspects of the local communities. The objective is to analyze the socio-economic changes to the communities' overtime, and assess whether they are seeing a net benefit as a result of the project implementation.

This study intends to:

i) Quantify and document changes in social economic wellbeing impacts as a result of project activities.
ii) Involve the community to identify their needs and concerns related to the project activities and suggest measures
iii) Obtain views from primary stakeholders and/or other stakeholders pertaining to the company and include into the management practices.
iv) Evaluate and monitor the economic wellbeing of the communities within short proximities to the project overtime
v) Determine the influence of the project to the culture, population and social behaviors to the communities.
vi) Create community awareness about the company goals and the various issues that it undertakes.

Findings from implementation of the community monitoring plan will be used to implement remedial measures.

SECTION F. Local stakeholder consultation

F.1. Modalities for local stakeholder consultation

>> BFC commissioned both an Environmental and Socioeconomic Impact Assessment[48] and Ecological Survey[49], intended to bring out all issues of concern from the stakeholders. These studies formed the basis of the stakeholder consultation process and participation in the project design and implementation. Project staff have also been conducting stakeholder consultations at different levels; primary and secondary levels of stakeholder consultations. Reports of stakeholder consultations have been produced and shared with stakeholders at various levels.

Methodology Used

i. The following methods were used to collect and compile stakeholders' comments: Introduction of the company to stakeholders:

A short profile of KFP (BFC and GRAS) was given to the key stakeholders one month before any discussions began so as to ensure greater awareness among participants regarding the company's objectives and activities. The profile comprised a description of the proposed A/R CDM activity, company objectives, operations, certification and

[48] Environmental and socio-economic impact statement report of Kachung Central Forest Reserve, Dokolo District, Eviro-Safety Consult Ltd, March 2008

[49] Okullo et al, 2008, Ecological Survey of Kachung Central Forest Project Area, Dokolo District. Makerere University, Faculty of Forestry and Nature Conservation

achievements including existing contributions towards local community development efforts.

ii. Establishing PRA/ mobilization team:

The teams were set to conduct the PRA, which consists of a social expert and the community representatives. The mobilization team helped generate ideas to improve community support programmes and obtain feedback on both positive and negative impacts of KFP activities on the surrounding communities.

iii. Village meetings:

To acquire comprehensive information regarding the historic and current situation and existing problems in local communities, as well as to understand the needs and wishes of local farmers, a meeting of farmer representatives was held for each selected village. The PRA team also used this chance to introduce the project objectives and specific CDM A/R project requests, as well as collect the feedback from the farmers on the project design. To better use the village meeting, group interviews were also conducted. The PRA team interviewed village leaders, senior villagers, representatives of ethnic minorities group, representatives of women, farmer households.

iv. Questionnaires:

Questionnaire forms were developed and distributed to different stakeholders, including key informants like schools, farmers, village leaders, sub county governments and forestry authority. The questionnaires covered information and feedback on: the local socio-economic profiles, land use, land tenure and land management, farmer income and sources, farmers' preference in tree species selection and production arrangements, technical and financial barriers in A/R practice.

A copy of questionnaire is available for validation and verification as a supporting document.

v. National, Regional and District Level Discussions:

Following the questionnaires, the project proponent made formal discussions with key stakeholders from the National, Regional and District levels. These discussions were aimed at 1) examining the extent to which the stakeholders understand the activities of the project participant/promoter and the proposed A/R CDM project activity; 2) evaluating the performance of the project participants and its impacts to stakeholders and 3) collecting comments for improvement. The following key stakeholders were interviewed in the process: NEMA (National Environmental Management Authority), National Forestry Authority (NFA), Ministry of water and Environment (Meteorology department), National Social Security Fund (NSSF) – Lira District, Uganda Revenue Authority (URA) –Lira District, Uganda Carbon Bureau, Makerere University (MUK), and Natural Resources Office – Dokolo district and NGOs.

Village meeting for the primary stakeholders

F.2. Summary of comments received

>> Stakeholder comments from the range of different levels and groups as outlined in appendix 6 are summarized as follows:

1. Primary stakeholders

- Local communities welcomed the project because it would provide employment opportunities to local people for both skilled and unskilled workers
- The project would also lead to development of community infrastructure around the reserve for example roads, water points, schools, health centres
- Communities would also acquire new knowledge and skills in tree planting and other technologies
- Income generation by selling wood and non-wood products;
- Community investment from the sale of carbon credits;
- Income generation from increased employment: Local farmers can get additional income by participating in the site preparation, planting and forest management practice.
- Easy access to employment due its locality to the communities means that other livelihoods don't need to be sacrificed
- Rejuvenating their shrub-grasslands and barren lands would improve the local environment and shelter croplands
- Local farmers/communities indicated that without the proposed A/R CDM project activity it would be impossible for them to plant trees on the project area due to the large pre-investment, lack of technical knowledge, organizational barriers and low economic return in terms of the degraded, remote lands
- Provision of seedlings to communities to establish their own wood lots
- Local farmers and communities favour tree species that grow quickly, fruit trees and those that have a readily available market, such as *Artocarpus hetrophylllus* (Jack fruit), *Khaya senegalensis* (Mahogany), *Gmelina arborea* (Malayina), *Citrus cinensis* (oranges), *Vitellaria paradoxa* (Shea tree), Firewood tree species , *Pinus caribea*, apiary tree species, measopsis eminii etc
- Others felt the project would deprive them of land for cultivation and grazing

2. Secondary stakeholders

- Praised the A/R CDM project that would enhance biodiversity conservation in KCFR

- Local governments would generate revenue through taxes on KFP
- Pledged support towards A/R CDM project
- Income generated from sale of carbon would be used for community development KFP should support community forestry

(1) Local forestry department (NFA): National Forestry Authority as well as local forestry farmers considers that the proposed A/R CDM project activity will increase the forest resources, improve the local environment, enhance biodiversity conservation and increase the income of local farmers and communities. They would provide technical training and consultation to communities and planting entities, and supervise the implementation of the proposed A/R CDM project activity along with KFP management.

(2) Local Governments: Sub-county and parish governments all consider that the proposed A/R CDM project activity can improve the local economy and alleviate poverty to local communities, especially for the ethnic minority group, and at the same time benefit global climate change mitigation and biodiversity conservation as well as improve soil erosion control.

F.3. Consideration of comments received

>> The comments received from the PRA survey were fully taken into account and are being considered as follows:

- Participation of local farmers/communities in the project – through work or development initiatives in communities - is on a voluntarily basis. The community development officer was appointed to develop a platform to facilitate dialogue between communities and the project. The CDO also works with a community mobilization team who were voluntarily appointed by the communities from each village.

- Preferences of local farmers/communities were taken into account in the selection of tree species. Also the company will not plant near the waterways so as to protect these water bodies.

- No fertilizers will be applied but aqua soil will be applied dribbling rather than overall dispersion to minimize its environmental impact. Use of chemical pesticides will be limited. Instead, the diseases and pests will be mainly controlled by mixed tree species arrangement and other biological measures. Herbicides will be applied especially before planting and manual slashing will done after planting until the canopy closes;

- Food shortage and poverty is being addressed by the company employing many more people from 300 to 600 persons and better methods of agriculture will be implemented to solve food shortage. Programmes for agro-forestry and improved agriculture will be incorporated to benefit the community.

- Social livelihood of the people will be improved by the company contributing to the development of existing hospitals, schools and roads and developing the trading centres and settlements through increased employment of the local population. This is well illustrated by the project

development plan adopted by integrating the community need assessment in the EIA and ecological study with the sub-county development plan (Agwata).

- Some of the tree species used are locally native and a mixed arrangement of species is used in planting to minimise disease attach and use of chemicals. For example indigenous Maesopsis eminii

- The comments collected from stakeholders are also presented to project management in the form of reports; which are then discussed and a suitable response prepared and sent inform of feedback to stakeholders.

- Comments obtained from stakeholders have been incorporated into project management plan at various levels. The project is now reviewing the forest management plan and other relevant project documents to accommodate stakeholder views which are considered pertinent.

- The project has also developed a comprehensive community development plan to address development challenges facing communities in the project area. The Community development plan incorporates the sub-county local government three-year development plan, the recommendations of Ecological survey, Environmental and Socioeconomic Impact Assessment and stakeholder's comments

- GRAS employment policy gives priority to local staff both as skilled and unskilled workers. More than 90% of KFP workers both permanent and casual originate from the project area.

- Key recommendations of the Environmental and Socioeconomic Impact Assessment and ecological survey and stakeholder's comments have formed part of project management working documents in project operations. In some instances, prompt corrective measures have already been taken to address some of the issues/concerns raised

- In order to promote community participation in project activities, management has identified community mobilisers from each village of the project whom act as a liaison between communities and KFP

- There is continuous dialogue and interaction with stakeholders at different levels. This is done through consultative meetings, courtesy calls, planning meetings and sharing of information

SECTION G. Approval and authorization

>> The project participants contracted an independent agency to carry out the SocioEconomic Impact Assessment, namely 'Enviro-Safety Consults' in accordance with the regulations of the Ugandan government. A letter of approval demonstrating the acceptance by NEMA of the quality and contents of the EIA/SEIA will be made available to the DOE as additional supporting documents on request. The conclusions from the assessment are presented in section F.1, including negative impacts.

The references to supporting documents are listed as follows:

1. Environmental and Socio-Economic Impact Statement Report for the proposed A/R–CDM project activities, Kachung Central Forest Reserve by Kachung Plantation Project, prepared by Enviro-Safety Consults Limited, March 2008

2. Certificate of Approval of Environment Impact Assessment for the titled project Proposed Clean Development Mechanism Afforestation and Reforestation Project, certificate No. NEMA/EIA/1746 and signed by the Executive Director of NEMA

Appendix 1. Contact information of project participants

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Appendix 2. Affirmation regarding public funding

LFC received funding for 147 ha planted at KFP in 2006, 2007 and 2008 from phase 1 of the Sawlog Production Grant Scheme (SPGS), an EU funded programme to promote private investment in timber production in Uganda50. Phase 2 of the SPGS is up and running for the period 2009-2013. LFC has submitted an application for a further 500 ha of land for funding under the scheme. The funds received from phase 1 were half the cost of plantation establishment for the 147 ha, and was seen by GRAS as a good opportunity of diversifying risk of the project whilst simultaneously presenting good opportunities for capacity building through its educational and resource sharing workshops. No other public funds have been received for tree planting.

Table AN 2.1. Phase 1 SPGS planted areas

Year of planting	SPGS Phase	SPGS Area, Ha
2006 - 2008	I	147
2009	II	200
2010	II	300

[50] http://www.sawlog.ug/

Appendix 3. Applicability of methodologies and standardized baselines

Not applicable.

Appendix 4. Further background information on ex ante calculation of net anthropogenic removals

Not applicable.

Appendix 5. Further background information on monitoring plan

The monitoring plan has been prepared based on the provisions of the approved monitoring methodology – AR-AM0004 Version 4.

1 PURPOSE OF THE MONITORING PLAN

This Monitoring Plan provides guidelines on monitoring and operational procedures of the GRAS A/R CDM Project Activity at the KFP, which proposes to generate net anthropogenic GHG removals by establishing sustainably grown forests plantations of eucalyptus, pine and maesopsis species on degraded grass and shrubland.

This Monitoring Plan fulfils the CDM requirement that the project activity should have credible and accurate monitoring procedures to enable the evaluation of project performance and verification of the net anthropogenic GHG emission removals. It sets out monitoring procedures that follow the provisions outlined in the Project Design Document and the approved Monitoring methodology (AR-AM-0004).

2 THE A/R CDM PROJECT ACTIVITY

2.1 Project boundary

The spatial extent and location of the species planted under the A/R project activity, in each stratum, shall be recorded. As per the availability of remote sensing data of adequate resolution, project participants can assess the area planted and compare the changes observed in the planted area using remote sensing data and the data from ground checks, field monitoring, and from planting records. Any discrepancies between the area reported and the area estimated under the proposed A/RCDM project activity in any part of the strata or sub-strata along with the species planted, including the areas of mortality due to natural factors (e.g. fire and pests) and anthropogenic factors shall be recorded and reported.

2.2 Monitoring periods and frequency

The project monitoring is expected to cover the first crediting period of 20 years with a renewal of up to two times, starting from 2006. The project participants shall use the tCER approach to address for the non permanence. The monitoring plan provides flexibility and shall also include the monitoring frequency recommended under national standards but can be amended in response to changes that may occur in the project activity as long as such amendments are in line with the general monitoring process described in this plan and are approved by a DOE during verification audits.

2.3 Monitoring and operational procedures

The project participants shall use standard nationally available procedures to monitor all activities and operations. The project is also complying with FSC standards for it forestry operations. All measured and experimental data shall be documented and archived.

Operational procedures under this monitoring plan are defined as those of measuring and estimating net carbon stock changes associated with the plantations under the project, as well as general monitoring of forestry operations, and social and environmental impacts.

The project participants shall keep records of all activities like changes in the actual planted areas, nursery operations, site preparation and forest management.

3 PROCEDURES FOR MONITORING OF THE BASELINE AND PROJECT SCENARIOS

3.1 MONITORING OF THE BASELINE

The baseline carbon stock changes do not need to be monitored after the project is established, because the accepted baseline approach 22(a) assumes continuation of existing changes in carbon pools within the project boundary from time of project validation.

However, as a renewable crediting period has been chosen, relevant data necessary for determining the renewed baseline, including net greenhouse gas removals by sinks during the crediting period, shall be collected and archived to determine whether the baseline approach and baseline scenario are still valid or have to be updated. Reasons for a possible need for updating may include:

- National, local and sectoral policies that may influence land use in the absence of the proposed A/R CDM project activity;
- Technical progresses that may change the baseline approach and baseline scenario;
- Climate conditions and other environmental factors that may change to such a degree as to significantly change the successional and disturbances processes or species composition, resulting in, e.g., improved climate conditions and/or available seed source would make the natural regeneration possible that is not expected to occur for the current baseline scenario;
- Significant changes of political, social and economic situation, making baseline approach and the projection of baseline scenario unreasonable;
- Existing barriers that may be removed, for instance:
  - Removal of existing investment barriers: Local farmers (communities) can afford the high establishment investment in the early stage or have a change to get commercial loans from banks for the reforestation activity;
  - Removal of existing technological barriers: Local farmers (communities) get knowledge and skills for producing high quality seedling, successful tree planting, controlling forest fire, pest and disease, and etc.;
  - Removal of existing institutional barriers (e.g. well-organized institutional instruments to integrate separate households and address technological and financial barriers).
- Markets that may change the alternative land use, e.g. significant price rising of wood and non-woody products would make the degraded land economically attractive in the absence of the proposed A/R CDM project activity;
- Check that the baseline net GHG removals by sinks are not under estimated before the crediting period can be renewed using control plots.

The carbon stock changes in the baseline scenario can be estimated by measuring carbon stock in the above-ground biomass control plots respectively at the initial and at the end of the crediting period. The control plots shall be established outside the project boundary and serve as proxy and accurately reflect the development of the degraded land in the absence of the project activity. Measuring the carbon stock change in above-ground biomass is sufficient for the purpose of baseline scenario checking.

3.2 Monitoring of the Carbon Stocks of the Planted Area

The project participants shall monitor the implementation of the A/R CDM project activity through monitoring the boundary, forest establishment and the forest management operations. The project monitoring team will monitor and record the plots on which A/R project activity is undertaken in each stratum over the crediting period. In monitoring the A/R, particular emphasis will be paid to the varieties of tree species being planted in eligible areas. Changes in the plots will be recorded, including the areas of mortality due to natural factors (e.g. fire and pests), and anthropogenic factors in any part of the strata and sub-strata.

The project participants shall ensure that the established plantation is protected over the crediting period. The fire line and firebreaks shall be established. In event of fire and pests outbreak the stratum affected shall be recorded and mapped. Replanting of the areas should be done and data recorded for each stratum. The factors affecting the carbon stock changes shall be monitored.

3.3 Monitoring using Permanent Sample Plots

Permanent sample plots (PSPs) are used for sampling over time to measure and monitor changes in carbon stocks of the relevant carbon pools in each compartment. The plots are treated in the same way as other lands within the compartment and stratum e.g. in terms of site preparation, weeding, pruning, thinning, harvesting, etc. Once ex-post stratification has been carried out the number of PSP's required will be calculated. The ex-post stratification will be carried out in GIS and allow for the area of each stratum to be calculated. Equation 61 from AR-AM0004 will be used to calculate number of PSP's required per stratum to reach a confidence level of 90%. (using parameters derived from existing plantation data from the region) The project participants anticipate using circular shaped PSP of 200-400 m2. The plots will be systematically located with a random start in each stratum or sub-stratum.

Unique number tags are assigned on all trees inside the plot towards the bottom of the trunk. These numbers are written by use of oily paint on aluminium covers to allow keeping the information concerning the tree and easy for cross-referencing. All trees are marked with a small weather resistant dot of paint at DBH i.e. at 1.3 m height so that the same point is measured all the time during measurement. All markings of the trees will be as inconspicuous as possible to prevent staff from knowing where the sample plots are.

Each tree within the PSP that has achieved measurable diameter at breast height (DBH) (20 mm) will have its DBH measured; however, trees that were present in the baseline and have been conserved will not be included in this. Trees that have not achieved measurable DBH shall just be counted and recorded.

Height measurement is dependent on the type of volume equation being used. The most common is to measure the 100 tallest trees per hectare. In order to do this, the number of trees to measure varies proportionally with the size of the sample plot. For instance, if the sample plot has a radius of 11.28 m, it has an approximate area of 0.04 ha, which is 1/25th of a hectare. This means that for the plot to be representative of a hectare, 1/25th of 100 trees, or four trees, should be measured. The minimum number of trees that should be measured for a plot of any size is two. The following table shows how the number of measured tree heights varies with plot size:

Plot size	Number of trees measured
1 ha	100
0.5 ha	50
0.04	4
0.02	2

The height of each tree will be measured and recorded twice using a hypsometer. On slopes, measurements will be made at right angles to the slope. Trees of large diameter but with crown damage (broken tops, etc.) will not be included in this sample.
Furthermore, trees will be assessed qualitatively for various abnormalities, disease and damage, and a coded note given. If there is no suitable coded note, an explanatory comment will be written.
All the trees in the plot have to be numbered both on the ground and on the data entry sheets. Tree numbering progresses clockwise and tree number one should be the tree in the northerly direction but nearest to the plot centre (See figure below). If two trees are in the same bearing, then the tree nearest to the plot centre comes first (tree number 14 and 15 in the figure shown below).

Tree numbering procedure

4 INSTRUCTIONS ON DATA COLLECTION

4.1 General instructions

Collecting reliable field measurements is an important step in the quality assurance plan. Standard procedures should be followed to collect reliable data to ensure the estimation of credible baseline and project emissions

During the monitoring process, the senior personnel overseeing the carbon monitoring activities shall verify data collected by the field personnel. The project entity must implement procedures that will ensure independent verification. Considering the differences in the electronic and paper based formats, there must be clarity in the terms defined and procedures followed. Particular attention shall be paid to monitoring and measurement errors and mandatory data checks shall be performed.

4.2 Data storage

The project entity shall make necessary arrangements for data entry on the registry forms in paper and electronic formats and ensure transfer to the spreadsheet database at required intervals as outlined in the monitoring methodology. The data shall be archived using acceptable standards and stored in compliance with the instructions of the project information management system: The project entity shall adopt both paper and electronic formats to ensure that the information is stored in multiple formats. All GHG related information is collected and aggregated into monthly and annual data. The electronic data shall be stored securely at multiple locations using monthly back-up procedures.

4.3 Information (data) management system:

The project information management links the operations of the field data collection and spreadsheet database management and outlines responsibilities of staff involved in collecting field data and organizing spreadsheet database. The supervisory staff overseeing the field data and spreadsheet database must certify the data each month and provide necessary clarifications on the changes, if any in the data collected and processed during the month.

5 GUIDANCE ON MONITORING OF THE ENVIRONMENTAL AND SOCIAL ISSUES OF THE PROJECT

The project will develop an environmental monitoring protocol in line with the recommendations in Section F. Environmental monitoring will comply with FSC and CCBA requirements.

The project has developed a socio-economic monitoring plan. This will be targeted at assessing livelihood changes across all sectors of the village communities as a result of the project activities. This is available to the certifier on request. This will be carried out every three years.

6 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

To ensure net anthropogenic GHG removals by sinks are to be measured and monitored precisely, credibly, verifiably and transparently, a QA/QC procedure will be implemented.

a) Standard Operating Procedures (SOPs) will be developed for all procedures such as:

i. GIS analysis ii. Field measurement iii. Laboratory methodology iv. Data entry
v. Data documentation
vi. Data storage

b) Training courses on all data collection and analysis will be held for all relevant persons involved in the project.

c) Verification of data quality

SOPs will also be established to verify the accuracy of all procedures.

i. GIS analysis
10 - 20% of sampling units will be randomly selected for re-measurement by an independent measurement team. Any errors found will be corrected and recorded.

ii. Field measurement
- 10 - 20% of plots will be randomly selected for re-measurement independently
- Any deviation between measurement and re-measurement above 5% will be corrected and recorded.

iii. Laboratory methodology
- 10 - 20% of laboratory samples will be randomly selected for re-measurement by an independent, qualified measurement team.
- Any errors found will be corrected and recorded.

iv. Data entry
- 10 - 20% of data entry records will be randomly selected for re-entry by a qualified team member and both sets of data compared with each other
- Incorporate checks in the programs used to analyze the data such as upper limits for dbh. Any errors found will be corrected and recorded.

- If there are any problems with the data entry that cannot be resolved, the plot will not be used in the analysis.

v. Data storage
Data archiving will be completed in multiple formats. Copies of all data will be held by multiple project participants and at multiple locations. Data will be stored on durable media such as CDs and updated to new archiving media as technology develops. Original copies of all field measurements, laboratory data, and data analysis spreadsheets will be archived.

Appendix 6. Summary report of comments received from local stakeholders

Not applicable.

Appendix 7. Summary of post-registration changes

Type of changes specific to afforestation or reforestation project activity

Under the Guidelines on accounting specific changes of A/R project activity from the PDD (EB 66, Annex 24), the following changes occurred relative to version 8 of the PDD, dated 4th September 2012.

Changes in year-wise areas planted
Table B.2.6.1 below shows annual deviations in the planted areas for the three species and overall an increase in Pine and a decrease in Eucalyptus and Maesopsis planted areas. Year-wise planting changed due to eucalyptus species not performing as well as the pine species. In addition, a significant area of Maesopsis failed – see summary below.

Changes in species composition
The PP planted more area of Pine than is stated on the PDD and less of Eucalyptus and Maesopsis, leading to a change in the species composition (see table B.2.6.1 below). Pine represents 91% of forest cover for KFP instead of 74%, Eucalyptus 9% instead of 15% and Maesopsis 0.0 % instead of 10% due to its failure in 2010 with no surviving stands in 2017. This area was replanted with *Pinus caribaea*. Under the Guideline from EB 66 Annex 24 the PPs must demonstrate that such a change would not affect the additionality of the project. Considering that this change means a larger area of pine has been planted, and that pine has a longer rotation than eucalyptus, there's a larger part of the project investment with a longer period of return (the age until clear fell for eucalyptus is ~10 years and pine is ~20 years). Therefore, the IRR of the project carbon finance is even more important, and thus, a stronger case regarding additionality. The planting in 2013 and 2014 is mainly replanting of failed eucalyptus stands.

Changes in stocking density
The PP planted 18.39 ha of Pine at 2.5x2.5 m as a trial planting instead of 3x3 m as stated in the PDD. Since this change is applied to a small area thus not affecting additionality, it is deemed acceptable under paragraph (c) of Guideline from EB 66 Annex 24.

Table B.2.6.1 below shows annual deviations in the planted areas (ha) for the three species

Species	2006	2007	2008	2009	2010	2011	2012	2013	2014	**Total**
Pinus										
PDD	16	138.9	254.8	396.7	498.8	257.6	0	0	0	1562.8
Planted	15.7	123.5	227.9	292.8	617.7	292.8	123.1	50.5	3.8	1748.1
Difference	-0.3	-3.9	-25.9	-92.7	144.1	63.8	134	134	134	487.1
Eucalyptus										
PDD	31.1	0	64.5	25.4	105.2	89.9	0	0	0	316.1
Planted	9.5	0.0	48.9	0.0	28.1	35.1	25.5	30.0	0.0	177.1
Difference	-21.6	0.0	-15.6	-25.4	-77.1	-54.8	25.5	30.0	0.0	-139.0
Maesopsis										
PDD	0	0	0	9.6	87.5	122.9	0	0	0	220.0
Planted*	0	0	0	0	0	0	0	0	0	0.0
Difference	0	0	0	-9.6	-87.5	-122.9	0	0	0	-220.0

Stratification

In the PDD it was estimated that the stratification would be done in species age cohorts of two years; for example, Pine 2006 – 2007 and Eucalyptus 2010 – 2011. However, the ex-post stratification was designed so that each year was a separate cohort for each species; therefore, Pine 2006 and Eucalyptus 2010 being examples of two separate strata. This change is acceptable in accord with paragraph (k) of EB 66 Annex 24.

Number of sample plots

The total number of sample plots implemented ex post for the first monitoring period was less than ex ante number due to several factors including; a different ex post stratification being used, different variance found ex post; and different areas being used. However, for the second monitoring period it was more capture the larger variation. The final number of samples plots was as follows:

Ex ante:

	Cohorts			
Species	2006-2007	2008-2009	2010-2011	Totals
Pine	17	17	17	51
Eucalyptus	17	17	17	51
Maesopsis	-	16	17	33
Totals	34	50	51	135

Ex post:

	2012 (R)	2017	Sum
e06	6	0	6
e08	12	0	12
e10	6	0	6
e11	3	0	3
e12	0	6	6
e13	0	5	5
p06	7	0	7
p07	22	0	22
p08	26	0	26
p09	25	0	25
p10	0	70	70
p11	0	36	36
p12	0	8	8
p13	0	2	2
Sum	107	127	234

This change is acceptable in line with paragraph (m) of EB 66 Annex 24. Section C provides more information on sampling design.

Parameters

The PP is using methodology AR-AM0004 for calculating net anthropogenic GHG removals by sinks and is using basic density, root-to-shoot ratio and carbon fraction values according to the methodological tool EB 70, annex 35 as these render more accurate estimates of these

parameters. This change is deemed acceptable in line with paragraph (p) of EB 66 Annex 24 and doesn't affect additionality.

Furthermore, BEF values were also revised to provide a more conservative value of this parameter and thus more reliable this was done in last monitoring period and was not changed in this monitoring period.

The basic wood density of Eucalyptus and the BEF of Eucalyptus and Pine as stated in the PDD and updated in the MR are shown below in the table:

	Basic wood density $D_{wood\ j}$		Density (over bark) D_j	BEF		R	
	PDD	MR	MR	PDD	MR	PDD	MR
Pine	0.51	-	0.494	3.4	2.7	0.20	*
Eucalyptus	0.75	0.526	0.507	1.3	1.25	0.23	
Maesopsis	0.41	-	-	-	-	-	-

*EB70, A35: R = exp(-1.085+0.9256*ln(A)), where A is above ground biomass per ha

The value now used for eucalyptus refers to basic wood density and is country and species specific. It is from a recent study[51] on the strength properties of timber species in Uganda and is thus considered more precise. This change is considered acceptable in line with paragraph (p) of EB 66 Annex 24 since it enables a more precise estimation of the carbon stocks – see section D.2.for more information.

As for the BEF values, the source remains the same, IPCC GPG 2003, as this is the most reliable source found available, but PP adopted a conservative approach by using the value that falls half way between the mean value and the lower value of the range instead of using the mean value of the range for each species.

Document information

Version	*Date*	*Description*
10.0	28 June 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale afforestation and reforestation CDM project activities" (CDM-SSC-AR-PDD-FORM); • Make editorial improvement.
09.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
08.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.

[51] A. Zziwa, Y.N. Ziraba and J.A. Mwakali, Strength properties of selected Uganda timbers, International Wood Products Journal, vol 1, no1, 2010.

Version	*Date*	*Description*
07.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for afforestation and reforestation CDM project activities (these instructions supersede the "Guidelines for completing the project design document form for afforestation and reforestation CDM project activities " (Version 01.1)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.8.4 and Appendix 1; • Change the reference number from F-CDM-AR-PDD to CDM-AR-PDD-FORM; • Make editorial improvement.
06.0	13 March 2012	EB 66, Annex 10 Revision required to ensure consistency with the “Guidelines for completing the project design document form for afforestation and reforestation CDM project activities”.
05.0	30 July 2010	EB 55, Annex 22 Restructuring to reflect changes applied in the design of approved A/R CDM baseline and monitoring methodologies. Due to the overall modification of the document, no highlights of the changes are provided.
04.0	19 October 2007	EB 35, Annex 20 • Restructuring of section A; • Section “Monitoring of forest establishment and management” replaces sections: “Monitoring of the project boundary”, and “Monitoring of forest management”; • Introduced a new section allowing for explicit description of SOPs and quality control/quality assurance (QA/QC) procedures if required by the selected approved methodology; • Change in design of the section “Monitoring of the baseline net GHG removals by sinks” allowing for more efficient presentation of data.
03.0	29 September 2006	EB 26, Annex 19 Revisions in different sections to reflect equivalent forms used by the Meth Panel and facilitating the transparent selection of an approved methodology for the proposed A/R CDM project activity.
02.0	24 February 2006	EB 23, Annex 15a Inclusion of a section on the assessment of the eligibility of land and the Sampling design and stratification during monitoring.
01.0	03 September 2004	EB15, Annex 6 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: afforestation reforestation, project design document

Appendix 8. Declaration on small-scale afforestation and reforestation project activity

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