FUELLING A GREENER FUTURE FOR FARMERS IN MALAWI THROUGH THE USE OF JATROPHA CURCAS

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Bio Energy Resources Ltd.
Fuelling a greener future

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project is a re-vegetation activity aimed at utilising degraded and marginal land for the establishment of *Jatropha Curcas* hedgerows, mainly along fields and homesteads.

Jatropha is a tree of the *Euphorbaciae* family, whose seeds contain about 30-35% oil, which can be extracted by crushing and expelling, and cleaned to produce bio fuel. In this case, production of bio fuel is intended for domestic use in Malawi. The project works with an extensive network of predominantly smallholder farmers across the country to establish Jatropha as a viable additional cash crop.

Background to Bio Energy Resources Ltd (www.berl.biz)
Bio Energy Resources Ltd. (BERL) is a Malawian company with the aim of establishing a national bio fuel business within Malawi. BERL will establish Jatropha as an additional income crop for smallholder farmers who will subsequently provide the raw materials for bio fuel production.

In the short term, BERL will establish a community farmer-based planting programme to plant Jatropha trees throughout Malawi (SOP 3.1 BERL Operational Areas and Districts v.1.2). This will provide the seed for centrally located processing plants, to be built over the first ten years of the programme. In the longer term, it intends to provide Malawi with products with increasing demand and be a leader in the supply of rural energy. There are extensive opportunities for the production of fuel and solid waste by-products, all adding value to the outputs. BERL will focus on products like bio fuel to replace existing fossil diesel and bio fuel for rural energy for lighting. By-products like fuel briquettes/charcoal and organic fertiliser will be produced from the seedcake

In light of the four major crises' that are now part of the modern-day world: the financial crisis, the energy crisis, the climate crisis and the food/poverty crisis, BERL wants to target all four of these areas with an integrated approach. If an integrated approach is not taken then BERL cannot be sustainable.

For the financial crisis, BERL will have a positive impact by saving foreign currency for Malawi. For, the energy crisis, BERL will reduce the dependence on fuel import by producing a local product. Contribution to the mitigation of the climate crisis will be reached by green house gas emission reductions with the sequestration of the Jatropha trees and substitution of fossil fuel by bio fuel. Employment creation is also a positive contribution to the Malawian economy; the food/poverty crisis at farmer level is relieved by providing farmers with additional income throughout a large part of the year from the Jatropha nut harvest.

The investor TNT NV is a Dutch multinational that has a long-term partnership with the United Nations World Food Program (WFP). When TNT and WFP evaluated the initial five-year partnership in September 2007, they agreed to continue to work together indefinitely so long as they added value to each other's causes. In addition to continuing their joint emergency response, knowledge transfer and awareness/fundraising initiatives in support of WFP's School Feeding Programme, the two organisations also determined to explore new ideas and frameworks that would create more sustainable solutions to fight global famine. One opportunity already identified to help create sustainable income generation in the agriculture sector is the production of cash crops for bio-energy purposes – in particular Jatropha. TNT will continue to take the lead in helping WFP to fight the root causes of famine and find sustainable solutions that will benefit needy communities in the long term. By supporting the development of sustainable bio fuel agriculture in particular, TNT can at the same time strive to find new ways to reduce its greenhouse gas emissions and influence climate change in a positive way. It is a win-win situation for TNT and a win-win situation for agricultural development in places like Africa.

The programme objectives include:

- Addressing global climate change through the removal of CO_2 from the atmosphere

- Enhancing current income and securing the livelihoods of some 286,351 farmers across Malawi, and thereby improving food security in areas that have suffered historically from uncertain food production and income
- Improving soil conditions of degraded land or areas prone to land degradation
- Reducing erosion caused by traditional slash and burn practices and wind impacting on large expanses of barren land in between planting seasons
- Increasing environmental education and understanding in rural communities
- Providing employment and training opportunities for technicians and extension workers
- Developing a local market for a non competing crop
- Providing local energy sources for Malawi

Table 1: Targets per Phase

Time	2006 - 2008	2008 - 2010	2011 - 2013	2014 - 2019
Phase	Seed Phase	Establishment Phase	Market Phase	Expansion Phase
Years	0	1 - 3	4 - 6	7 - 12
Planted trees per year		1,1 / 1,6 and 3,96 mio	4,95 / 5,94 and 6,93 mio	7,92 mio each year
Seed Production (*1000) (at end of phase)		0.23K ton	2,94K ton	28,30K ton
Processing (expelling and cleaning)	Processing research	Planting and processing	Planting and processing	Final years planting, growing and yield
SVO produced (million litres)				15
Charcoal produced (ton)				21,500
Fertiliser produced (ton)				5,500
No. of farmer clubs		2,227	7,627	22,027
No. of farmers		33,405	99.151	286,351
No of women involved		45%	45%	45%
Licences		Obtain licence for bio fuel productions and storage		

As part of the programme, the proposed ARR project has initiated and maintains an extensive tree planting programme and aims to grow some 72 million trees covering some 21,600 ha, over a 12-year period. This extensive network of trees, predominantly hedgerows of Jatropha, represents a significant increase in the vegetation and biomass maintained for the long term. Carbon dioxide is sequestered through the growth of woody biomass.

This PD covers the Jatropha planting activities only and not the processing of biofuel, possible future substitution of fossil fuel, or carbon aspects associated with by-products. As this is a Grouped Project future instances will be added (see Table 3) but this PD puts the plots forward for validation as presented in
Table 2.

Table 2: Number of Plots and Total Area to be validated in this PD (planting occurred in 2009/2010 season)

District	No. of clubs	No. of plots	Total Area of plots with overlaps removed (m2)	Ha
Dowa	79	605	897,722.1	89.77
Kasungu	126	820	1,067,674.3	106.77
Salima	50	320	323,527.2	3.24
TOTAL	**255**	**1,745**	**2,288,923.6**	**228.89**

Forecasts of the rate of project implementation once all instances are completed, is as follows:

Table 3: Project Implementation between 2008 and 2019 with Estimated Re-vegetation Activities

Year	Trees to be planted	Area to be planted (ha)	Area planted in ha (cumulative	Anticipated No. of existing clubs (total to date)
2008	1,170,000	351	351	993
2009	1,530,000	459	810	1,027
2010	3,960,000	1,188	1,998	2,227
2011	4,950,000	1,485	3,483	3,627
2012	5,940,000	1,782	5,265	5,527
2013	6,930,000	2,079	7,344	7,627
2014	7,920,000	2,376	9,720	10,027
2015	7,920,000	2,376	12,096	12,427
2016	7,920,000	2,376	14,472	14,827
2017	7,920,000	2,376	16,848	17,227
2018	7,920,000	2,376	19,224	19,627
2019	7,920,000	2,376	21,600	22,027

1.2 Sectoral Scope and Project Type

The proposed project activity falls into the Afforestation, Reforestation and Re-vegetation (ARR) category of the Agriculture, Forestry and Other Land Use (AFOLU) section of the VCS. More specifically, the project is a Re-vegetation activity.

The proposed project activity uses the CDM-approved consolidated afforestation and reforestation baseline and monitoring methodology AR-ACM0002: “Afforestation or reforestation of degraded land without displacement of pre-project activities.” (Version 01)

The project is a grouped project designed against the guidance provided in VCS AFOLU Requirements v3.0. Grouped projects are projects structured to allow the expansion of a project activity subsequent to project validation. Validation is based upon the initial project activity instances identified in this PD. This PD sets out the geographic areas within which new project activity instances may be developed and the eligibility criteria for their inclusion. New instances meeting these pre-established criteria will then be added to the project subsequent to project validation.

With respect to the applicability of approved CDM A/R methodologies to VCS Re-vegetation projects the VCS Standard v3.0 states that “where the rules and requirements under an approved GHG program

conflict with the rules and requirements of the VCS Program, the rules and requirements of the VCS Program shall take precedence."

In this PD the above guidance is made operational as follows: CDM A/R methodologies may be applied to VCS Re-vegetation projects, where:

1. The methodology is followed in full, other than requirements related to the definition of forest, and its application shall not negatively impact the conservativeness of the quantification of GHG emissions reductions or removals; and,
2. Project activities shall meet the VCS definition of re-vegetation and it is not required for such projects to result in the creation of a forest."

Future instances must also be re-vegetation activities with Jatropha or similar species (e.g. Pongamia).

1.3 Project Proponent

The proposed VCS project activity is developed, implemented and managed by Bio Energy Resources Limited (BERL), and supported by TNT Netherlands, which is providing primary financing.

Bio Energy Resources Limited (BERL)
BERL is a Malawian registered company.

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1.4 Other Entities Involved in the Project

Although BERL relies on its own trained staff and professionals, it collaborates with local and regional forestry department/agencies, including University of Malawi, Ministry of Natural Resources, Energy and Environment, Department of Forestry, Ministry of Agriculture and Food security, Tree crops (private company of tree research), United Nations World Food Programme and local NGOs in providing technical consultation and guidance, including training courses, quality control checks and technical inputs for the preparation and implementation of the proposed project activity. Project participants will also seek advice from local, national, and international forestry and sustainable forest management experts where required. BERL makes use of their directors' extensive experience with smallholder farmers.

Smallholder Farmers
The smallholder farmers are key project participants since these farmers will be responsible for the management of the trees. We have included a list of famer clubs in Annex 6.

TNT
Financing for the project comes from TNT Netherlands. BERL is a core component of TNT's corporate social responsibility program.

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SILVESTRUM
Silvestrum, a consultancy firm based in the Netherlands, has been associated with the project since 2008 and has provided its services to TNT and BERL over the years. Silvestrum has developed the project design and all carbon aspects of the project in such a way that it is compliant with the VCS standard. It has assisted BERL with the development of its management system, including the Standard Operating Procedures (SOPs) and coached BERL through the years in getting its Environmental Impact Assessment, Biomass Baseline Assessment, Socio-Economic Impact Assessment, Baseline Biodiversity Assessment, Fire Mapping, Forest Map of 1997 and initial carbon sampling in place. It has also conducted the initial risk assessment and assisted the project during the validation process.

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1.5 Project Start Date

Project Start Date: 8 July 2008, start date of planting included in this PD is 30 September 2009.

1.6 Project Crediting Period

Crediting Period: 30 years, start date 8 July 2008, end date 7 July 2038.
Lifetime of the Project: 30 years

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

The proposed project is neither a micro nor a mega project.

Project	X
Mega-project	

In this PD the plots included in the project are expected to generate emission reductions of 7,058 t C or 25,878 t CO_2e over the 30-year lifetime of the project.

Table 4: GHG removals of this Instance during the 30 years crediting period

Years	Estimated Cumulative GHG emission reductions or removals (tCO2e)
2008	-
2009	-
2010	2,917
2011	5,835
2012	8,752
2013	11,670
2014	14,587
2015	17,505
2016	20,422
2017	20,842
2018	21,262

2019	21,681
2020	22,101
2021	22,521
2022	22,940
2023	23,360
2024	23,780
2025	24,199
2026	24,619
2027	25,039
2028	25,458
2029	25,878
Total estimated ERs	**25,878 t CO2e**
Total number of crediting years	**30**
Average annual ERs	**863 t CO2e**

1.8 Description of the Project Activity

The proposed re-vegetation project activity will sequester carbon by removing CO_2 from the atmosphere and storing carbon in Jatropha. The activities carried out to achieve these emission removals are detailed below.

Jatropha has a number of properties that enable it to be a suitable crop that does not compete with food crops, it complements the revenue stream to farmers at little opportunity costs:

- It is drought resistant and does not require irrigation
- It grows on marginal and sandy soils where other crops cannot grow
- It requires little input after transplanting from the nursery to the field, therefore does not take the farmer away from other tasks
- It can be grown as protective hedge rows around crop fields, reducing soil erosion and keeping cattle out (it is poisonous and is not affected by cattle once the trees have matured)
- Nuts can be harvested from January-November; hence, income can be spread over an extended time period
- Jatropha fits very well in the existing farming system and crop calendar in Malawi, and does not compete for the farmer's time during periods when regular farming activities occur

Sensitisation
Field technicians of BERL visit villages that have expressed an interest in growing Jatropha. Such villages are visited various times before the actual plantings are established. During such sensitisation meetings, the context of the Jatropha project is explained along with the dos and don'ts for all parties involved. For instance, villages have to form grower clubs that jointly establish the Jatropha. BERL signs a contract with clubs rather than with individual famers (see Annex 1). The content of the contract is explained to the villagers during these meetings (SOP 6.1 Sensitisation Meetings/Awareness Campaigns v.1.1).

BERL has formulated land eligibility and site selection criteria, which cover VCS requirements (e.g. the land may not have been covered with forest in the last 10 years) (see SOP 6.2 Land Site Selection Criteria v.1.2).

Land Eligibility Test
To confirm that each plot of land is meeting the eligibility requirements, BERL staff conduct the land eligibility test using the criteria presented in Annex 2 (SOP 6.2.3.1 Land Eligibility Questionnaire v.1.2) for each piece of land. The land selection criteria include the following (SOP 6.2 Land Site Selection Criteria v.1.2):

- Jatropha cannot be planted in gazetted protected forest areas, even though the land may not be covered by forest now or in the last 10 years

- Jatropha cannot be planted on land that is covered by forest
- Jatropha cannot be planted on land that is waterlogged
- Jatropha cannot be planted on land that is unallocated communal land

The CLUB System of Farmers/Jatropha Growers
Due to the large number of individual smallholder farmers involved in the project, BERL has created a multi-tiered system of support and control. BERL has contracts with grower 'clubs' (see SOP 6.3 Club Selection Criteria v.1.1, SOP 6.4 Registration of Clubs and Signing the Contract v.1.1). A club is composed at village level and can have up to 15 members (during the start-up phase of the programme the maximum number of members was 25). On average, grower clubs have about 0.85 ha of land under Jatropha, consisting of hedges along fields (henceforth referred to as 'plantations' even though they may only consist of a short single line hedge). A village can decide to enrol their communal land for the benefit of the entire community. Outstanding farmers will be selected and trained to maintain contact with the second-year and older clubs, as 'lead farmers'. They will play an important role during promotion and procurement. To have them understand their position, they will receive training and will be monitored by Junior Planting Technicians (JPTs). Now that the lead farmer model has been fully implemented, a specific SOP has been prepared (SOP 4.2 Lead Farmers v.1.2).

Through this contract farming model, BERL oversees the distribution of Jatropha seeds to each club (see also SOP 7.2 Tools and Seed Delivery v.1.1, SOP 7.2.1.1 Jatropha Seed Distribution Coupon v.1.1). In addition, BERL provides technical assistance (SOP 4.1 Field Technicians v.1.1, SOP 4.2 Lead Farmers v.1.2) in growing seedlings, and the planting and maintenance of Jatropha trees (see also SOP 5.2 Details of Sequence of Activities v.1.1, BERL Planting Season Activity Calendar); and, some simple equipment to help the club to look after their plantations and nurseries. Annex 1 contains an example of the club contract (SOP 6.4.1 The Grower Contract v.1.1).

The clubs receive training (SOP 7.5 Training of Farmers v.1.1) on how to prepare the land for planting: how to dig the pits, how big they need to be and how deep, how to add manure or organic materials and what the spacing should be, etc. (see also SOP 7.3 Land Preparation v.1.1). Once the planting pits have been inspected, the farmers receive seeds, establish their nurseries (See also SOP 7.1 Nursery Establishment and Management v.1.1) and transplant (see also SOP 7.6 Transplanting and Early Establishment) with the first good planting rains.

After the establishment of the plantations, it takes approximately 15 months for the first harvest of Jatropha seeds (SOP 8.3 Harvesting v.1.2). From the moment of sowing, farmers have to continue tending to the trees (see also SOP 8.1 Tending v.1.1) even though there is not yet an income from the sale of the seeds. Maintenance activities include weeding, pest and disease control (see SOP 8.1 Tending v.1.1 and SOP 8.2 Pests and Diseases v.1.1) and, above all, not removing existing trees.

To overcome the lack of income from Jatropha until it starts to fruit, BERL is making incentive payments to the clubs (see SOP 7.7 Evaluation and Bonus Payment v.1.3). This payment is based on the amount of trees planted, properly maintained and surviving, the spacing of the trees and adequate weeding/firebreak making. Once the trees start to bear fruit, BERL buys the nuts at a price which at least matches that stipulated in the contract. In return, the farmers agree to plant, maintain and sell (see also SOP 8.3. Harvesting v.1.1) their Jatropha according to the standards and regulations that they have contractually agreed to in the Grower Contract (SOP 6.4.1 The Grower Contract v.1.1 / Annex 1).

Once the plants are producing seeds, BERL will provide technical assistance on harvesting. The seeds are then bought from the farmer by BERL who organises all transport and infrastructure requirements etc. Once the seeds have been crushed and the oil removed, the remaining material (the seedcake) will be made available to the farmer, to be applied to the fields as a natural fertiliser.

Contracting Clubs & the Geo-referencing of Land to be Planted
During the sensitisation meetings, some of the rules are conveyed to the prospective clubs, including the rules for land eligibility, the prohibition of removing natural woodland, trees or forest, and the burning of existing vegetation to clear the land. In addition, instructions are provided regarding spacing, and pit

sizes. For all of these activities, SOPs have been developed, and activities in the field are assessed (as described in a dedicated SOP) by the internal auditing staff of BERL against these SOPs (see also SOP 9.2 Introduction to Auditing v.1.1).

Once a club has been formed and has identified eligible land that can support at least 3,850 trees in total, the BERL Field Technician (FT) will conduct an assessment of the situation. Single line hedges must have a minimum of 200 plants (spacing 1 m).[1]

Besides recording data on the club itself (see Annex 3 for a Club registration form), BERL staff conduct a land eligibility test for each plot (SOP 6.2.3.1 Land Eligibility Questionnaire v.1.2). The landowners are clearly instructed not to cut down any original woody perennials. Once a plot has passed the land eligibility test, a single coordinate is established by using a GPS to locate the agreed planting site. Upon actual planting, the length of the hedge is recorded with a GPS and its geographic reference is determined by walking along the hedgerow (SOP 8.4 Mapping Instructions for Field Technicians v.1.3, SOP 8.5 GIS Processing v.2.1). Each plot then gets its own Identification Number (ID) and is logged in the database. Walking along the hedgerow will take place after the seedlings have been transplanted; this ensures that further recording of the GPS data happens when the trees are actually planted.

FT's visit the clubs and all of the fields at least 3 times (1. land eligibility; 2. first evaluation; 3. second evaluation). These visits are recorded and stored in a digital database. Additional visits are conducted during pitting, nursery establishment, transplanting and field management.

Future instances must be falling under the same project design, management regime and internal checks and balances.

Units of Operation

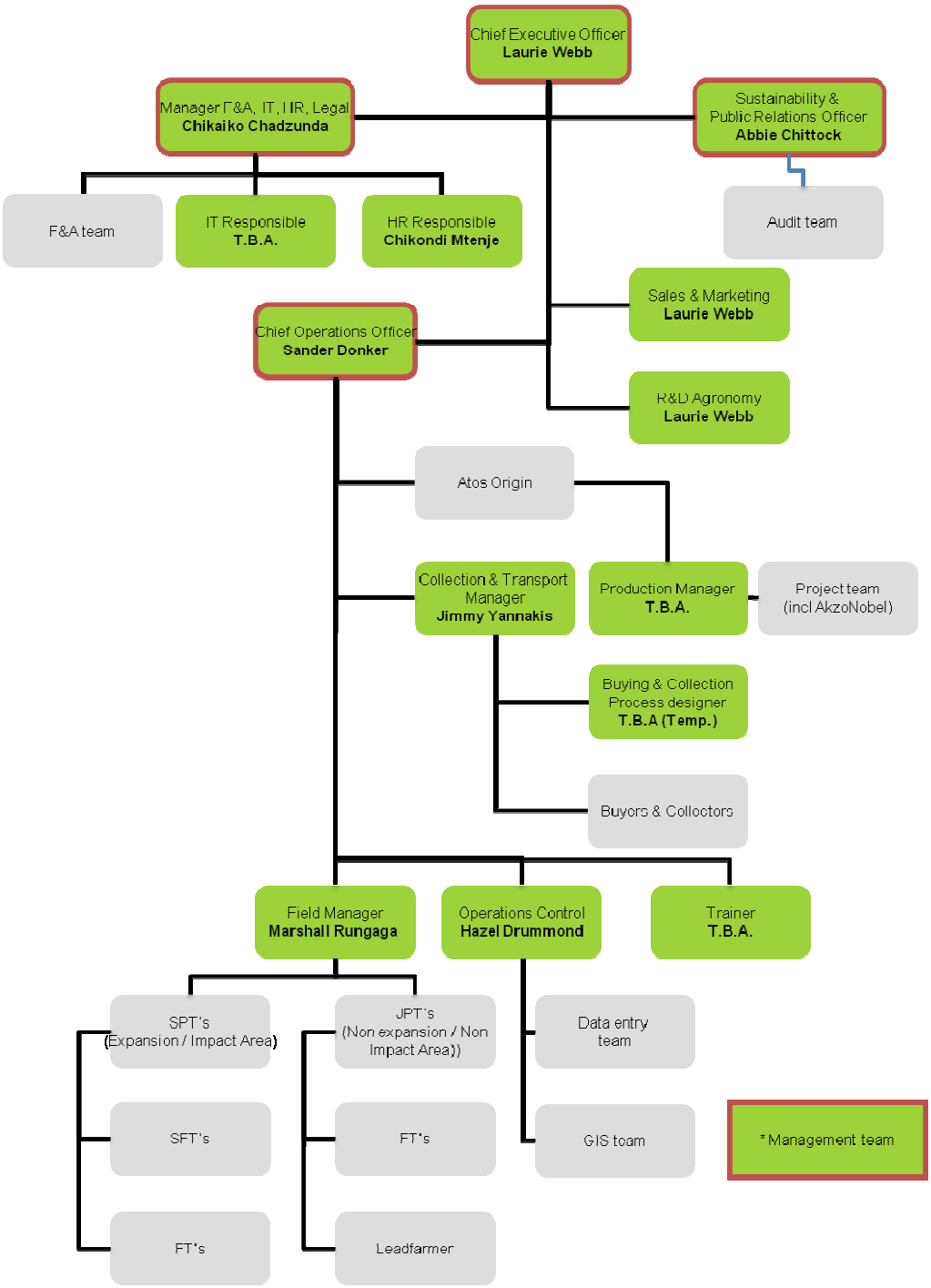
The growers' club is the basic unit of operation for BERL (SOP 6.3 Club Selection Criteria v.1.1). Traditionally, at the village level, the headman is responsible for all matters relating to land allocation and resolving conflicts. He/she need not be in the club, but must be informed of all club activities.

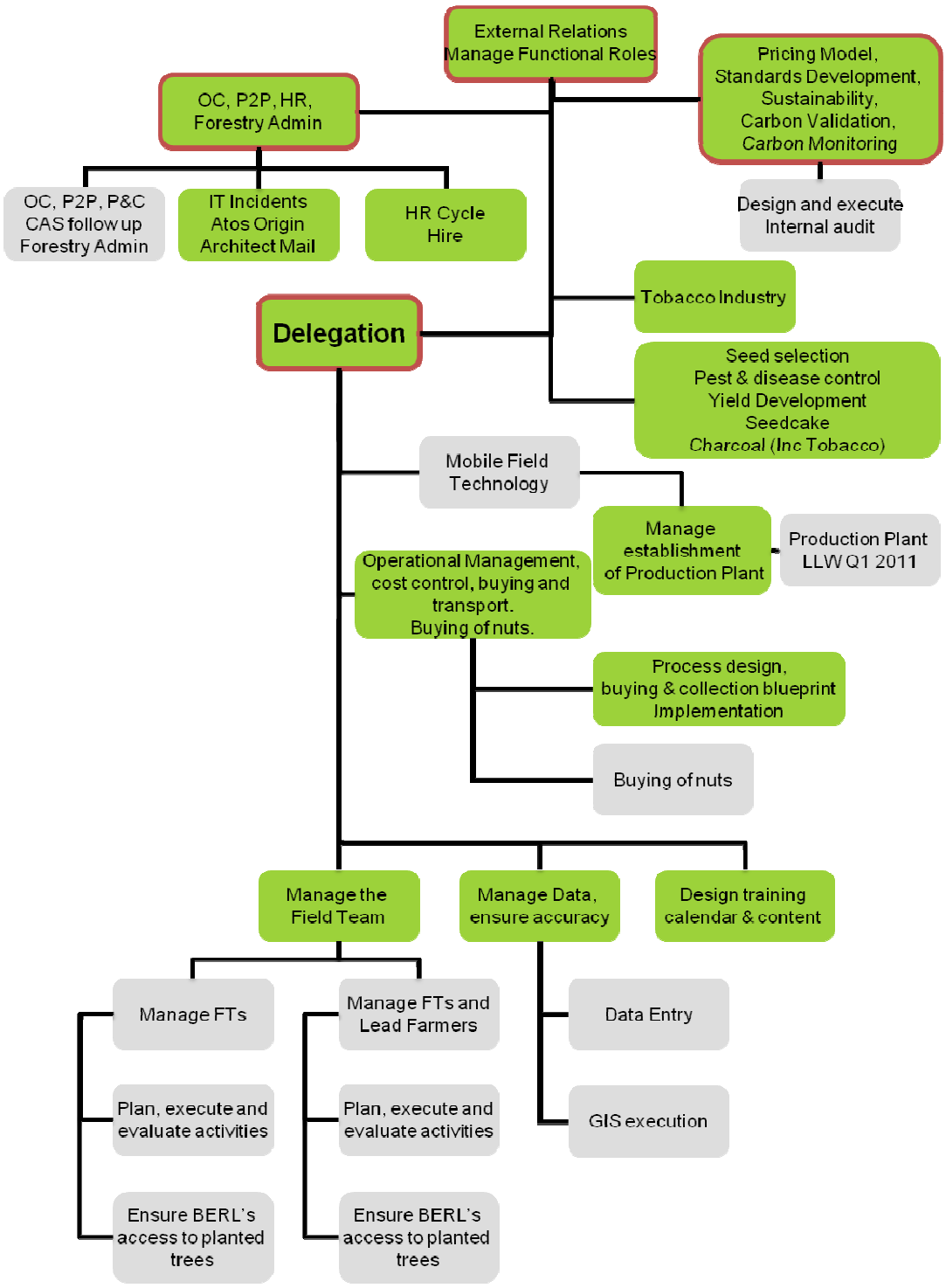
Field Technicians (FT's) are employed by BERL and each FT is in charge of 25-30 clubs (see SOP 4.1 Field Technicians v.1.1). To provide support and assistance to the FT's, BERL employs Junior Planting Technicians (JPTs, for non expanding areas) and Senior Planting Technicians (SPTs, for expanding areas), employed at the district level (see also SOP 3.1 BERL Operational Areas and Districts v.1.2). The process of bringing clubs under contract is described in Section 1.4. At the start, all FT's are hired as Trainees, they shadow a fully trained Senior Field Technician for a period of 3 – 6 months (subject to monitoring) and after satisfactory performance they are invited to attend a formal training at the Head Office (see SOP 5.1 Training of Field Technicians v.2.1). Subsequent to this, they receive regular refresher trainings during the season to ensure sufficient knowledge and practical background to support the farmers.

Once farmers have been approved and accepted into the project (SOP 6.4 Registration of Clubs / Signing the Contract v.1.1), they are provided with an extension package (a Club Record Book) to support what has been explained to them during the sensitisation meetings. In addition, they are provided with basic tools to plant Jatropha and the technicians are available for assistance to ensure that farmers are sticking to the guidelines provided. This ensures consistency in implementation across the proposed areas.

[1] In the 1st planting year, these rules on minimum plot sizes were not in place, which resulted in high numbers of plots per club and sometimes small sizes of individual plantings (e.g. a hedge of 50 m). This has been rectified in planting year 2 and later, but the clubs of year 1 were maintained in the project as it is not considered good practice to disqualify them in retrospect.

Figure 1: BERL Staffing, Management Structure, Roles and Responsibilities




External Relations
Manage Functional Roles
Pricing Model, Standards Development, Sustainability, Carbon Validation, Carbon Monitoring
OC, P2P, HR, Forestry Admin
OC, P2P, P&C CAS follow up Forestry Admin
IT Incidents Atos Origin Architect Mail
HR Cycle Hire
Design and execute Internal audit
Tobacco Industry
Delegation
Seed selection
Pest & disease control
Yield Development
Seedcake
Charcoal (Inc Tobacco)
Mobile Field Technology
Manage establishment of Production Plant
Production Plant LLW Q1 2011
Operational Management, cost control, buying and transport. Buying of nuts.
Process design, buying & collection blueprint Implementation
Buying of nuts
Manage the Field Team
Manage Data, ensure accuracy
Design training calendar & content
Manage FTs
Plan, execute and evaluate activities
Ensure BERL's access to planted trees
Manage FTs and Lead Farmers
Plan, execute and evaluate activities
Ensure BERL's access to planted trees
Data Entry
GIS execution

The Experience with Farmer Clubs in Malawi

Tobacco Production

During tobacco production in Malawi the use of farmer clubs was introduced in 1989 (see also Tobacco Association of Malawi 2000/2001): "The establishment of tobacco production clubs nationwide after 1989, when the Special Crops Act was removed, and especially in 1995, when the structural reforms were launched, also provided many small-scale farmers with the opportunity to produce tobacco. Under the club system, several smallholders work collectively to produce and sell tobacco. About 93 percent of sales by the clubs have been of burley tobacco."

The development of intermediate buyers and of tobacco production clubs attracted many smallholder farmers to tobacco production over the past decade. As a result, the number of tobacco growers increased rapidly after 1990, especially after 1994. The number of registered tobacco growers for burley and flue-cured increased six fold, from 9,500 in 1990 to 68,150 in 2000. The planted area increased from around 100,000 ha in 1993 to 170,000 ha in 2000."

National Smallholder Farmers Association of Malawi (see also: Malawi RIU Country Assessment, 2007)

NASFAM was formed in 1994/95 to support farmer clubs initially in the marketing of tobacco, then later other smallholder crops. NASFAM associations are made up of clubs that work together as a group to complete actions such as marketing. Clubs in turn form associations of 300-5000 members. Member associations jointly own NASFAM Development Corporation (NASDEC) which comprises a number of commercial agribusiness associations. In addition a subsidiary (NASCENT) provides services that straddle the private-public sector divide such as information services, training, policy advocacy and outreach.

NASFAM presently comprises 44 associations or Chapters operating in 106 Extension Planning Areas with over 6000 farmer clubs.

Development Africa People for People

With support from USDA, DAPP in Malawi will implement a well designed Farmers' Clubs program that will aim to achieve, among other things, the following (see also www.dapp-malawi.org/TextPage.asp?MenuItemID=55&SubMenuItemID=121):

- Promotion of diversification into high valued crops for smallholder farmers.
- Strengthening of the institutional and extension support systems at section, block and District level through capacity building.
- Intensifying soil fertility and sustainable natural resource management, including water shed management and agro-forestry through trainings and provision of basic supplies.
- Diversifying from maize - based food habits and fostering nutrition education and diet diversification with concomitant training in production of crops e.g. green vegetables , cassava etc.
- Expanding small-scale irrigation to increase the number of growing seasons on all land holdings. Promoting small agribusiness development technologies and skills for rural non farm sector and
- Promoting affirmative action for women farmers, as these fall into the categories of the poorest of the poor.

The benefits outlined above will reach out to 11 500 farmers over a three year period. It is further anticipated that 69 000 people will indirectly benefit from the project.

Land preparation

To prevent soil erosion, limit GHG emissions and protect existing carbon stocks, site burning, strip ploughing and overall tillage will not be employed during site preparation (SOP 7.3 Land Preparation v.1.2): planting pits are dug manually with the use of hoes, along linear rows, causing minimum disruption to the soil. Planting holes are 50 x 50 x 50 cm. Boundary/contour hedges are formed mostly by a single row hedge with a planting distance of 1 m between plants.

A boundary hedge has to start 1.5 m from the field boundary (leaving space for the trees to develop without shading cropland or overgrowing the boundary walking track). In the case of sloping terrain, the layout can be adapted by using a line level, while respecting the spacing of rows along the contour.

The planting pits can be made during the dry season in advance of the rains. In this manner the time-consuming work of pitting is undertaken before other land preparation places demands on the community's or grower's time. The topsoil must be placed on one side and the subsoil on the other. Before planting, the pits must be refilled with the addition of 1 kg of manure to each pit (about a quarter bucket). The topsoil must be replaced first in the bottom of the pit and the subsoil must be replaced on top (SOP 7.3 Land Preparation v.1.2).

A number of inspections conducted by the FT's ensure that the farmers adhere to the above rules. This is stimulated by the bonus payment made by BERL to the farmers in the 1st year. Bonus payments are only made if the work is conducted according to the requirements. If the work is not up to standard this has to be rectified by the farmers and their bonus payment will be reduced according to pre-set guidelines (SOP 7.7 Evaluation and Bonus Payment v.1.3).

An independent internal audit team checks all the work in the field according to the SOPs (see SOP 9.2 Introduction to Auditing v.1.1).

Sowing

During the 2008/09 growing season, planting was done by direct seeding. Sowing was carried out at the start of the rainy season, which generally begins in November and lasts until February/March. BERL provided free seed, which was delivered corresponding to the number of pits dug to avoid wastage. The Jatropha seeds were sown directly into the soil pit by hand. Planting and seed handling instructions were provided on the seed bags in the local language, and the FT's were available to provide advice and technical assistance. If after 2 weeks some seeds failed to germinate farmers did the gapping up.

For the 2009/10 planting season and the future, BERL has decided to have the farmer clubs establish small local nurseries at club level to produce seedlings rather that to conduct open soil seeding. The requirements for establishing a Jatropha nursery are conveyed to clubs and growers during a series of field days (SOP 7.5 Training of Farmers v.1.1), during which the FTs provide technical information and assistance to clubs. A SOP for nursery establishment and management (SOP 7.1 Nursery Establishment and Management v.1.2) lays out the guidelines for the nursery field days, as carried out by the FT's, the site selection criteria for nursery establishment, the preparation, sowing and weeding of seedbeds, and potential mechanisms for the control of pests and diseases. Similarly, seed is provided based on targets set by the club (SOP 7.2.1.2 Jatropha Tools and Seed Distribution Form v.1.1). Transplanting is done within two weeks after the onset of rains (SOP 7.6 Transplanting and Field Establishment v.1.2). If after 2 weeks the seedling dies, another seedling from the safety bed should be transplanted for gapping up. After transplanting, the seedling requires little further care except weeding, and by month 3 it should be well established (see also SOP 7.1 Nursery Establishment and Management v.1.2).

Weeding

To ensure high survival rates and good growth in the early stages, weeds are controlled by slashing manually for three years after planting. Time and frequency depend on the appearance of weeds. During the rainy season, weeds are removed from strips at 50 cm on either side of the trees by hoes. The trash should be placed onto the ground in between the weeded strips (where vegetation is still growing, assisting in soil erosion prevention). This strip must be cut with a slasher to prevent weeds setting seed. In March, all weeds are hoed. The trash must be aligned on the contour and covered in soil. In July/August, the covered trash will have become compost and must be dug up and spread around the trees. In October/November when pruning the trees, the pruning litter should be added with the hoed trash from the 50cm ground (either side of the tree) and placed in between weeded strips. (SOP 8.1 Tending v.1.1).

Future instances must follow the same Standard Operating Procedures (SOPs) that govern the activities described above (e.g. pitting, sowing, and weeding).

Research

In association with Chitedze and Chitala Research Stations and the Natural Resources College, BERL is conducting trials in technologies associated with bio-fuel. This will provide local input into a worldwide

network of similar research and opportunities for Malawian academics. Research stations are linked with the Ministry of Agriculture and Food Security, Department of Agricultural Research Services (DARS).

Carbon monitoring
The carbon monitoring will start in 2011 in cooperation with Bunda College, the department of Forestry. They have developed a field manual for BERL to start with the carbon sampling.

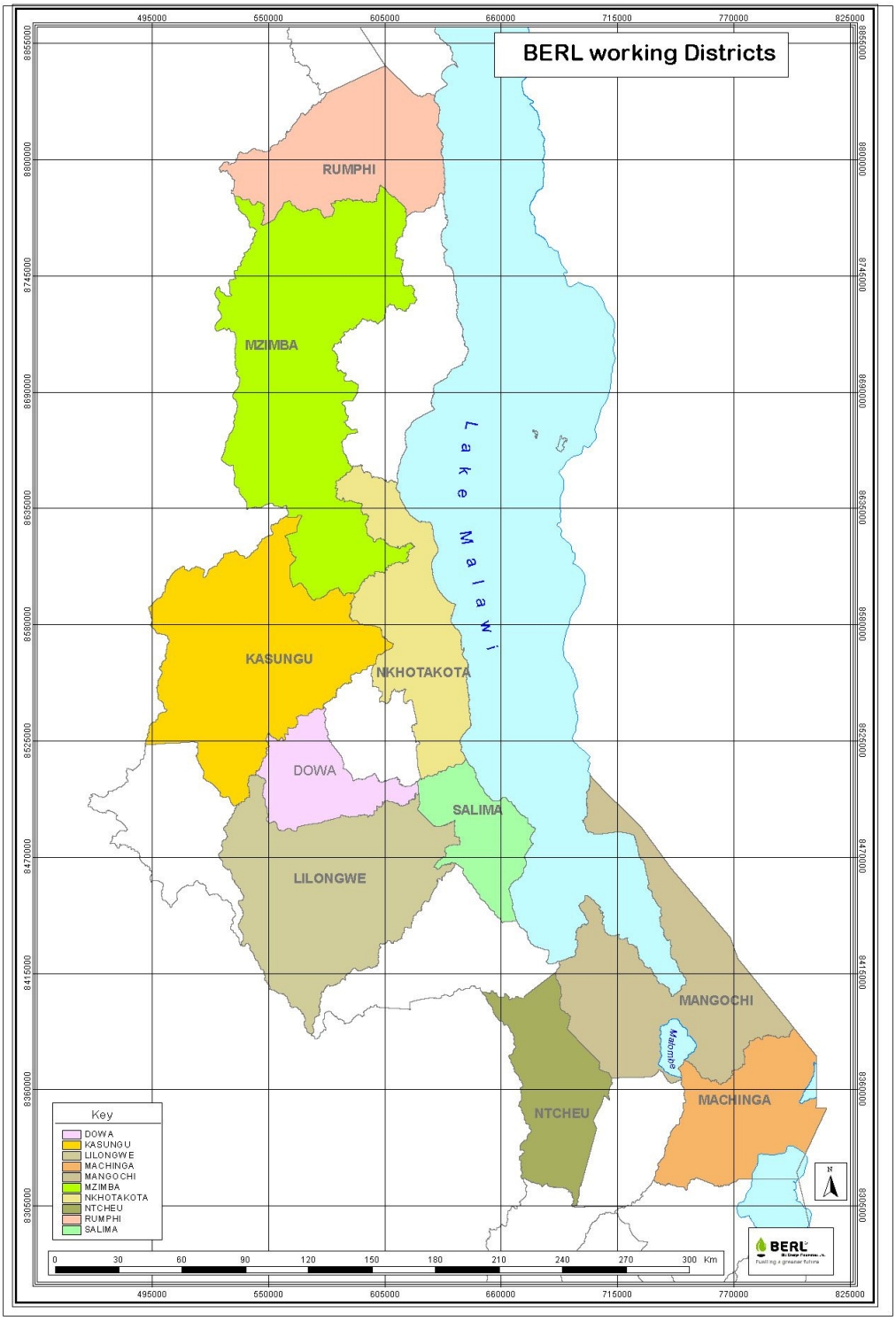
1.9 Project Location

The Republic of Malawi is a small landlocked country in southeast Africa (see Figure 2). The country borders with Zambia, Tanzania and Mozambique, these last two separated by Lake Malawi, which is the dominant geographical feature of the country.
Project areas are located in the following districts, constituting the area of the Grouped Project: Rumphi, Mzimba, Kasungu, Nkhotakota, Dowa, Salima, Lilongwe, Ntcheu/Dedza, Mangochi and Machinga. These districts are located on the map in Figure 2b.

Figure 2: Location of the Grouped Project Area

Figure 2a: Location of Malawi in East Africa

Figure 2b: Grouped Project Area: District Level Map



Determination of the Forest Cover 10 years prior to Project Initiation

To generate to Forest Cover map for Malawi Landsat images of 1995 – 1997 were obtained and the following processes were performed using the image processing software IDRISI Kilimanjaro.

Three bands were extracted (1, blue 2, green and 3, red band) for all the images involved. After the importation process, the images were re-projected from Zone 36, North to 36, South (i.e. these bands are acquired with a wrong projection, North instead of South).
Then the individual bands (1s, 2s and 3s) were mosaicked to form a relatively large areal coverage (mosaicking process is conducted on bands and not on composed images).
After mosaicking the three bands were then composed into an image with blueish shades as bare areas and red shades as areas covered with green vegetation (i.e. infra-red part of the electromagnetic spectrum is reflected by chlorophyll in green vegetation, hence, red implies chlorophyll presence).
Images were then exported from IDRISI environment as TIFF's so that they can easily be imported into other software for further analysis.

Visual Image Interpretation process
The process gives meaning to what is seen on the image using the colour, shape of features, texture, and relationships with other known features among other elements.
In the exercise, once the images were now composites, the following were conducted;

- Composed images were displayed in Arc View and the colours adjusted so that red pigment representing vegetation comes out clearly for easy demarcation. This was done by increasing the contrast of band 3.
- Then manual digitizing of what looked like having a considerable amount of red pigment was picked and classified as an area covered with vegetation at the time the image was captured. In which case every site was treated individually.

Local knowledge application
Landsat images have a resolution of 30x30 m, which is 900 m^2. For each pixel an assessment was made, using IDRISI Kilimanjaro, whether that area was covered by forest in the year the satellite image was recorded. As the current forest cover is definitely different from the situation around 1997, it is not possible to ground truth the analysis. In that respect the current situation and knowledge of the land is essential and must be combined with the information contained by the images.
Not all that has chlorophyll are trees; grass too displays a lot of red pigment just as trees with fresh leaves do. The generic principle that has been applied is to assess the absorption/reflection of areas that are surely covered by a particular vegetation type (e.g. tea plantations, pine/eucalypt plantations) and analyse each pixel of the Landsat images of 1995 – 1997 against that 'finger print' or 'signature'. This way, all areas that were covered 10 years ago by that vegetation type are classified. Using the existing local knowledge the entire country has been assessed like that. For instance, in this exercise, marshy areas were excluded by knowing where these marshes are in Malawi. e.g. the occurrence of Elephant and Ndindi Marshes in the lower shire and the surrounding areas of Lake Chilwa amongst other water bodies.

Plantations such as sugar and tea, which have some considerable areal coverage, were also excluded. Illovo Sugar plantation in Chikwawa and Nkhotakota were excluded from what was classified as forest areas and so was tea in Thyolo and Mulanje.

Some sites though covered by forest may display different colours depending upon the species of trees on the site. Pine plantation in Mzimba and Nkhata Bay (Chikangawa) may not display that bright red pigment as Eucalyptus (Bluegum) or other broadleaved tree species do. Implying that colour display alone may not provide a complete picture of what forest coverage is.

Other sites like Nyika plateau have a mixture of trees and grass; lower slopes, and the river valleys have woodlands while the plateau is predominantly grass. One has to make decisions on some sites such as those with thorny bushes whether to classify them as forests or not which tends to be subjective. In this particular case, to be on the safe side, such areas have been classified as forest and include those in the southern region, particularly Chikwawa, Mwanza and Neno where the thorny or thickets type of bushes occur.

The classification also included protected area boundaries, as most sites left for forest cover are actually protected areas. E.g. Kasungu National Park and Dzyalanyama Forest reserve are distinct in their coverage due to very clear borders between agriculture land and the protected areas. However, due to

high pressure for agricultural land as a result of high population density some of those areas are actually not covered by forest anymore. However, in the forest map the protected areas have been included to ascertain no Jatropha will be planted within such reserve areas. Finally, the forest cover map of 1997 has been combined with the areas that are now forest reserves (even if there is no forest there now) and the area that forms part of this project. The resulting map illustrates that none of the areas of the BERL project overlay with protected areas, forest reserves, or areas that were covered by forest in 1997.

The pixel resolution has been instrumental in determining whether an area classifies as forest or not. For Landsat images the pixel resolution is 30x30 m (except for panchromatic band which has 15m pixel). Portions smaller than that were left out as they posed as isolated groups of trees not extensive enough to qualify.

Future instances must also fall outside the forest boundaries of the map describing the forest extent of 10 years before the start of the project.

General description of Malawi's geo-physical characteristics
The information provided here is general to Malawi because BERL operates in many districts. Annex 4 contains more detailed information per district where BERL operates. As outlined in Section 1.9, the areas planted with Jatropha on the boundaries of farmer fields are mainly covered with grasses that are burnt annually, and some shrub land.

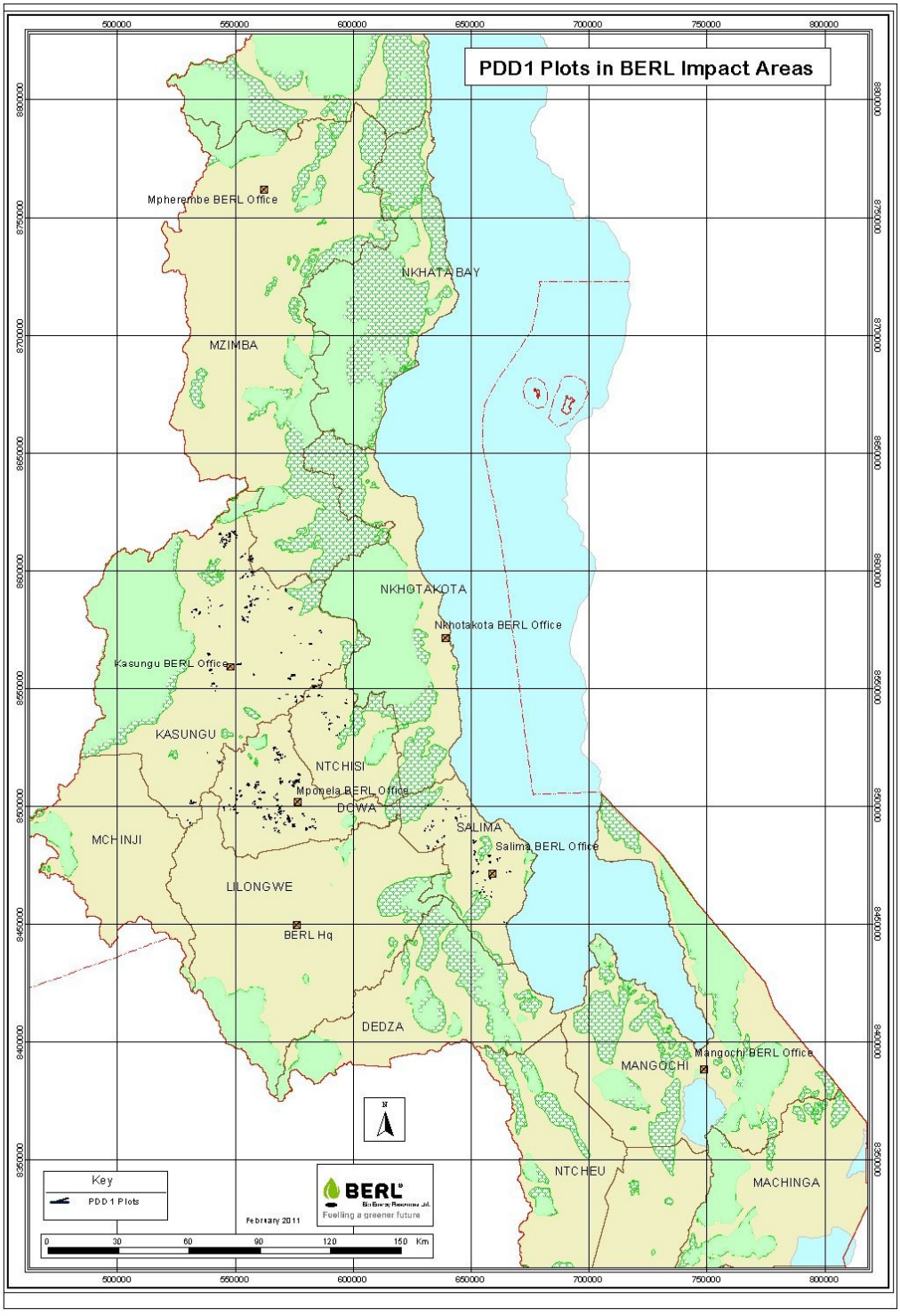
Climate, rainfall and temperature
The climate of Malawi is tropical and has two main seasons. The wet season starts in November and ends in April-May, while the dry season occurs from May to October. Mean annual minimum and maximum temperatures are between 10 and 35 degrees Celsius and distribution of rainfall (800 mm - 1500 mm and above) varies widely over the districts. (EIA, 2009).

Vegetation
Malawi has 2.4 million ha of surface water, and 9.4 million ha of land. Of the land area, 31% is suitable for the country's rain-fed agriculture, 31% is marginal land and 37% is unfit for cultivation. The land that is unfit for cultivation is either under grass, shrubs, and/or used as game reserves. Most of it is degraded: previously cultivated but now providing very low productivity due to salinity, soil erosion, nutrient leaching and other factors.

In general, the vegetation and habitats in Malawi are divided in five main categories, namely: mountain forests, *Brachystegia (miombo)* woodlands, mopane woodland, dambo (wetlands), low altitude woodland and park land; but obviously only a small part of the land is actually covered by these vegetation types.

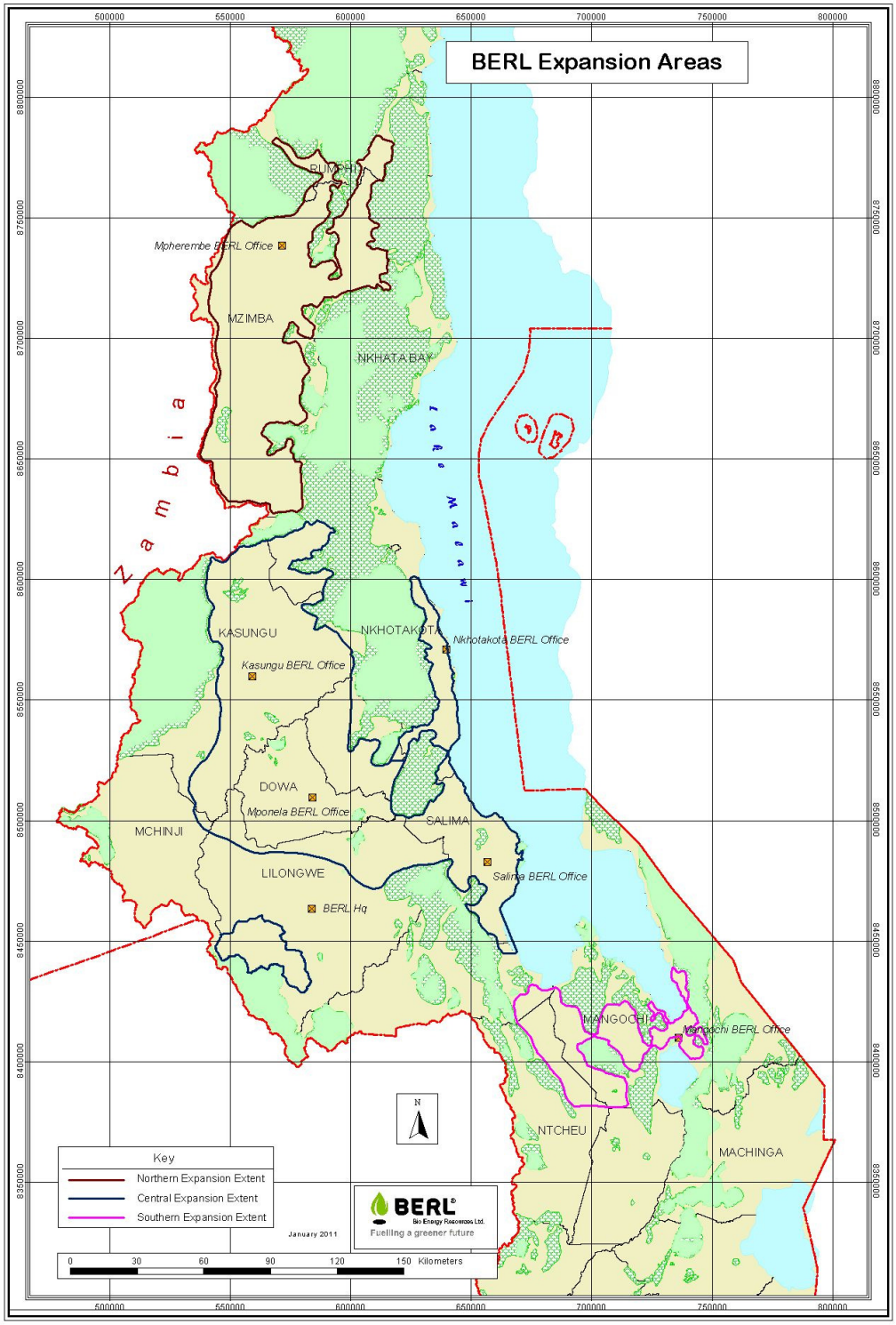
BERL is targeting to plant Jatropha on the degraded land that is mostly covered by grasses and this is envisaged to have an overall positive environmental impact (Biodiversity survey, 2008). More detail on district specific vegetation can be found in Annex 4.

Figure 3: Location of Jatropha Polygons Included in this PD; Established in 2009/10 Season in Malawi. Forested Areas as of 1997 are Indicated in Chequered Green.



New instances must be located within the geographic boundaries as indicated on the map below.

Figure 4: BERL Expansion Areas for the Next 10 Years



1.10 Conditions Prior to Project Initiation

Malawi has a total area of 11.8 million ha, of which 9.4 million ha is land. The remaining 2.4 million ha, about 20%, is covered by water, mainly lake Malawi and lakes Chilwa, Malombe, and Chiuta and various rivers. Out of the 9.4 million ha of land, 31% is suitable for the country's rain-fed agriculture, 31% is marginal land and 37% is unfit for cultivation. The land that is unfit for cultivation is either under grass, shrubs, or used as game reserves. (Bunda College, 2008)

In Malawi smallholder farmers traditionally practice shifting cultivation, but pressure from rapidly increasing population has led to widespread soil degradation, indicated by high levels of erosion and reduced crop yields (DSOER, 2004).

The country suffers from forest degradation (resource declining at 2.6% per annum) largely because of poverty, population growth, agricultural expansion, infra-structural development and over dependency on wood fuel for energy. Over 93% of the population depends on biomass energy for heating and lighting. Biomass satisfies about 83.4% of household energy demand (AER, 2009).

The project establishes hedgerows of Jatropha around homesteads, on derelict land and along the boundaries of agricultural fields. As shown in Section 2.2 in relation to applicability condition 2, *District State of the Environment Reports* (DSOER, 2004) indicate that the vast majority of (agricultural) land in the districts where BERL operates is degraded. In terms of agriculture, this results in low per hectare yields and fertilizer use to the extent that the financial situation of the farmer allows.

Although the project promotes the establishment of hedgerows on degraded land that is not used for agricultural crops, most hedgerows are planted around the boundary of agricultural fields. The lines are planted 1.5 m in from the boundary to allow the Jatropha to grow to maturity insight the boundary. The land at the moment of planting may have some (perennial) grasses on them. When shrubs or trees are encountered in the line, the planting of Jatropha is interrupted, to be continued on the other side of the existing vegetation, or the line goes around it.

***Ex-ante* stratification**
For baseline net GHG removals by sinks only one stratum is recognised; all land is degraded and has no existing vegetation other than possibly some grasses.
For the *ex-ante* determination of actual net GHG removals by sinks the year of planting is used.

New instances must have the same conditions prior to project initiation.

Fire as major driver in the composition of the original vegetation
The major factor affecting the conditions of the land prior to project initiation is fire. The effect of fire and its impact upon the baseline scenario is elaborated below. Although each of the operating districts is detailed below individually, at the landscape level, fire is the controlling factor, as illustrated by the frequency of fire during the 8-year period prior to project initiation (Figure 5).

It has been confirmed that typically a reciprocal relationship exists between the vegetation and fire where the condition of the vegetation affects the fire, and the interval between fires determines the composition, structure and quantity of biomass available for burning (Sousa 1984 in Rebelo 2009[2]). Recurrent fires have the potential to influence the structure and the composition of the vegetation, and the extent to which this happens will be dependent on factors such as the species composition of the vegetation, their sensitivity to fire and their capacity to recover afterwards (Rebelo, 2009).

Currently the only global operational active fire information available is the MODIS Thermal Anomalies product with 4 daily observations: 2 AM and 2 PM. Under ideal day and night time conditions a flaming fire needs to be approximately 100 m^2 in order to have a minimum of a 50% chance of detection, while

[2] Lisa-Maria Rebelo 2009 *An Assessment of fire activity and biomass burning in Malawi, 2000-2008*

smouldering fires typically need to be between 10 and 20 times larger to achieve the same probability of detection (Giglio *et al.* 2003 in Rebelo, 2009). The MODIS Thermal Anomalies Level 3 summary product provides a composite of all (day and night) 1-km gridded (in tiles covering 1200 x 1200 km) fire pixels detected within each 8-day period.

The MODIS Aqua satellite was launched in May 2002, prior to this only morning observations of fire activity are available. It should also be noted that the active fire data only provides a snapshot of fire activity – only fires, which are burning at the time of the satellite overpass, and which are not obscured by clouds are recorded. It is, therefore, not a comprehensive dataset of fire activity within Malawi but certainly an underestimate of the real quantity of fires occurring.

Figure 5 illustrates all fires that have been detected (in red) between March 2000 and January 2009. Rebelo (2009) shows that some areas of Malawi burn every year, which is consistent with findings in the field.

It is apparent from the spatial distribution of fire frequencies that there are distinct clusters of land that have a high frequency of fire activity. Some 75% of MODIS pixels within Malawi have contained a fire twice in the 9-year period, while 30% have burned three times.

Determination of land eligibility

The methodology requires the use of the latest version of the tool "Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities" as approved by the Executive Board. However, this is a VCS re-vegetation project. Compliance with the tool to the extent possible is demonstrated as follows:

VCS definition of 'forest: "Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests".

VCS definition of 're-vegetation': "A direct human-induced activity to increase carbon stocks of woody biomass on sites through the establishment of vegetation that covers a minimum area of 0.05 ha and does not meet the definitions of afforestation and reforestation.

The project has drawn up a map of the forest cover in 1997. It has used Landsat images with a resolution of 30x30 m. This enables an assessment of forest cover that falls within the FAO definition for a forest put forward in the Forest Resource Assessment of 2010, being: "Land spanning more than 0.5 ha with trees higher than 5 m and a canopy cover of more than 10% or trees able to reach these thresholds in situ".[3] The map indicates the areas within Malawi that were under forest 10 years prior to the start of the project. Areas selected for project activities fall outside of these forested areas. Hence, the project has not cleared land of native forest ecosystems.

According to the same tool, at the time the project starts, land within the project boundary may not have any forest cover. This is achieved by using the definition of re-vegetation of the VCS prescribing a minimum area of 500 m^2. Because the hedges will be 3 m wide, and the Jatropha specimen are planted at 1-m intervals, this results in a minimum length of the hedge of 167 m. Combined with the rule that no existing trees may be cut, none of the area planted up has forest at t=0. This is confirmed through ground-based surveys for each parcel of land by the BERL Field Technicians and monitored/assessed by BERL internal auditing teams.

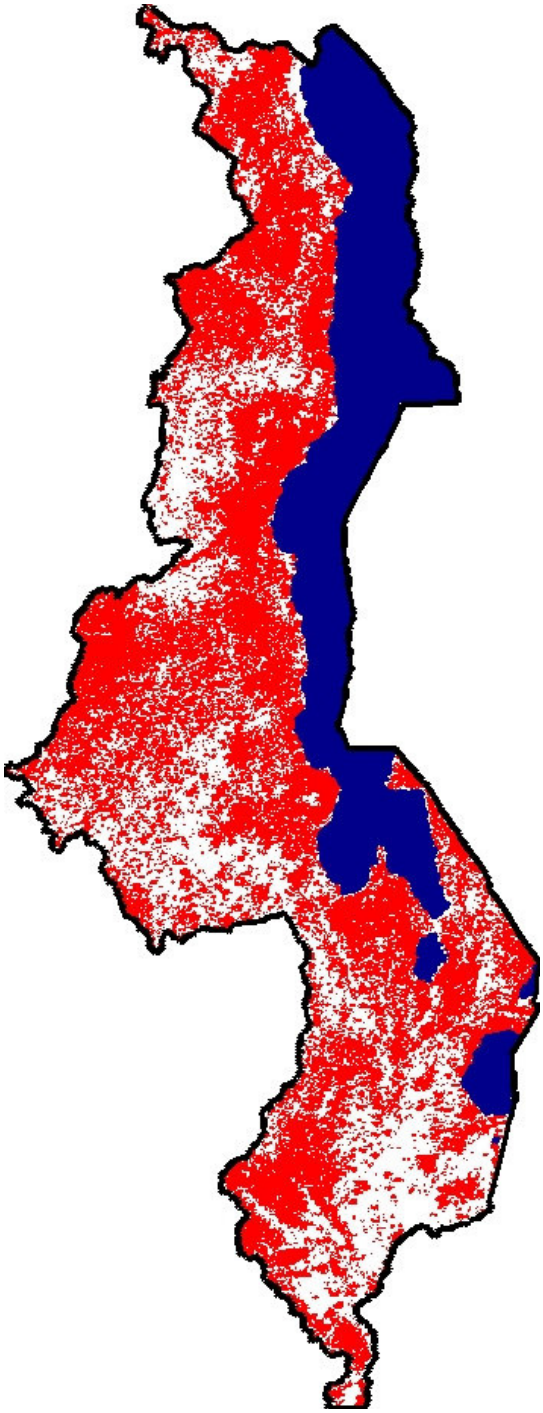
The 500-m^2 requirement must be met by each discrete parcel during the project crediting period and the individual contiguous parcels must have been planted at validation/verification. Survival rates of less than 100% may cause an incomplete stocking. Since the re-vegetation definition does not specify crown

3 Malawi has not registered a country-specific forest definition with the CDM Executive Board at the time this PD is drawn up.

coverage or any other measurable parameter than the minimum area, incomplete stocking does not give rise to splitting up polygons with the risk of not meeting the 500 m^2 requirement. Records can be provided to demonstrate that polygons have been planted and records of survival rates demonstrate that the stocking at validation/verification is a result of planted but died trees.

Future instances must meet the same eligibility requirements.

Figure 5: Fires that have been detected between March 2000 and January 2009



1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Malawi has, over the past ten years, developed a number of policies and legislation to foster environmental sustainability that have a bearing on the Jatropha production project. A brief description of the scope of the laws, acts and policies is given below. A full description of these laws can be found in Annex 5.
An assessment was made by the independent agency that conducted the Environmental Impact Assessment (EIA) and tested whether the project complies with or contributes to the objectives of the laws and policies. The outcomes of this assessment can be found in Table 5.

Relevant policies, strategies and legislation
Policies and Strategies:

- The National Environmental Action Plan (NEAP) is a framework for integrating the environment into all socio-economic development activities of the country, mostly linked with agriculture.
- The Malawi's National Environmental Policy is aimed at promotion of sustainable social and economic development through sound management of the environment and natural resources by various actors, including local communities.
- The National Forestry policy, advocates prevention of changes in land-use, which promote deforestation, constrain farm forestry or endanger the protection of forests with cultural or biodiversity or water catchment conservation values.
- The National Land Policy focuses on land as a basic resource common to all people of Malawi. It provides the institutional framework for democratizing the management of land and outlines the procedures for protecting land tenure rights, land-based investments and management of development at all levels. It ultimately seeks to promote optimum utilization of Malawi's land resources for development.
- The Contract Farming Strategy seeks to achieve economic growth and development in the agriculture sector by strengthening the access to markets for farmers.
- The National Land Resources Management Policy and Strategy aims at promoting the efficient diversified and sustainable use of land based resources both for agriculture and other uses in order to avoid sectoral land use conflicts and ensure sustainable socio-economic development.
- The Crop Production Policy aims at improving a balanced and diversified production of food and cash crops to meet the country's requirements for food, foreign exchange and raising rural incomes.
- The Malawi Growth and Development Strategy 2006-2011 (MDGS) builds on the Malawi Economic and Growth Strategy and the Malawi Poverty and Reduction Strategy. The main aim of the MDGS is to create wealth through sustainable economic growth and infrastructure development as a means of achieving poverty reduction.

Legislation:

- The Constitution of Malawi provides a foundation for responsible environmental management in Malawi.
- The Environment Management Act provides the legal basis for the protection and management of the environment and the conservation and sustainable utilization of the natural resources.
- The Forestry Act among other things seeks to: augment, protect and manage trees and forests on customary land in order to meet basic fuel wood and forest produce needs of local communities and for the conservation of soil and water; promote community involvement in the conservation of trees;, prevent resources degradation; promote optimal land use practices through agro forestry in small holders farming systems; protect fragile areas; to conserve and enhance biodiversity.
- The Land Act establishes that the government should provide for secure and equitable access to land as a resource and an economic asset.

Table 5 presents the findings of the EIA agency assessing the compliance of the project with the policy and legislative requirements. Please note that a number of policies prescribe environmental impact

assessments either as an obligation for large-scale projects, or recognize them as a tool for promoting sustainable management of natural resources. Therefore, by having undertaken an assessment, the project complies with legislation.

Table 5: Assessment of the EIA of Project Design in the light of the Relevant Legislation.

Legal instrument or policy	Project compliance as assessed by the EIA
The Constitution of the Republic of Malawi, 1995	Planting Jatropha in large quantities in Malawi is a new concept and would be a threat to biodiversity if Jatropha was considered invasive. Jatropha mass production would also be a threat to food security if appropriate control measures were not put in place, to avoid cultivation on land meant for food crops. Preparation of this EIA report, which included public consultation, is one way of ensuring that implementation of the Jatropha and bio-fuel production project would not introduce invasive species and would not degrade the environment.
National Environmental Action Plan, 2004	The NEAP outlines actions that need to be undertaken to ensure adequate environmental protection. The actions relevant to the Jatropha and production include: ▪ Promotion of agro-forestry ▪ Improvement of land productivity through sustainable land saving technologies ▪ Intensifying training of farmers in improved farming practices ▪ Improvement of management of forest resources on customary land
National Environmental Policy, 2004	The proposed Jatropha production project manifests a positive link between environment and development, and engages private and public actors. The project can address critical environmental and social problems such as soil erosion, dependence on charcoal and marginalization of women, children and other vulnerable groups in the economic productivity bracket. (EIA)
National Forestry Policy, 1996	The land use proposed for the project will contribute to revegetation and soil conservation. (EIA)
National Land Policy, 2002	Jatropha farming production will contribute to this policy by addressing some of the issues (EIA): i.e. land tenure, gender, child labour and improvement of land use practices. (BERL) A more elaborate description of the elements and issues of this policy can be found in Annex 5.
Contract Farming Strategy, 2007	Jatropha farming promotes the active participation of small-scale farmers in the agribusiness demand and supply chains. In addition, the farmers will have increased and secure access to new markets through technical support in extension services, farm inputs, managerial support, improved average prices and value adding. (EIA)
National Land Resources Management Policy and Strategy, 2000	The proposed project will promote increase in agricultural production and productivity and promote land resources conservation in accordance with the strategy. (EIA)
Crop Production Policy, 1987	The proposed project is in line with the crop production policy in that it will increase production and productivity, especially on marginal land. The project, if implemented according to the recommendations of this EIA will promote: • Distribution of food and cash crops to afford farmers equal opportunity of increasing income generation • Increased production in areas which have unsuitable agro-ecological factors and topographic conditions for the conservation of natural resources • Diversification of both food and cash crops for food security, promoting

	exports while accommodating changing market conditions • Appropriate technology transfer to farmers for steady improvement in yield (EIA)
Malawi Growth and Development Strategy 2006-2011	The priority area relevant to the Jatropha project is energy generation and supply. The availability of alternative renewable energy in form of bio fuel will contribute to the overall energy supply equation for the country by reducing demand on energy imports and ensuring alternative supply at times and remote places of need.(EIA)
Environment Management Act, 1996	The proposed bio fuel project is a prescribed project for which an EIA is required. (EIA)
Forestry Act, 1997	The project will be in compliance by avoiding activities in protected forest reserves (EIA). And, additional argument by the project: and by promoting the involvement of communities in the protection and enhancement of forests and trees. (BERL)
Land Act, 1965	The proposed project is land based and could therefore have negative impacts on land ownership and land tenure. The Local leaders would, therefore, have to ensure that there is no marginalization of disadvantaged groups (particularly women and the elderly) in access to land. Management of the environment and natural resources by the farmers can be better realized where there is secure land ownership and tenure. (EIA) The reply of the project: In order to guarantee the sustainability of the project, BERL makes agreements with individual farmers, and/or farmer clubs, respecting customary land ownership and tenure. (BERL)

New instances must also be in compliance with existing legislation.

1.12 Ownership and Other Programs

1.12.1 Proof of Title

The project has a contractual arrangement with all of the Jatropha growers and the Group Village Headman of that particular club (see SOP 6.4 Registration of Clubs / Signing the Contract v.1.1). This contract is also signed by the delegated authority of the Traditional Authority, namely the Group Village Headman. In the Malawi National Land Policy (January 17th 2002) it is stated that "the radical ownership remains in the Traditional Authority" (paragraph 4.7.1. of the Land Policy).

"Communal land rights in Malawi are closely connected to the ethnic identity and Traditional Authorities (TA's). This creates a powerful system of land allocation regimes and a tenure system designed to preserve the asset base of the community for current and future generations. People traditionally see land kinship in a genealogical map through which access to land is reached. Families and individuals are allocated exclusive fee simple usufruct in perpetuity subject only to effective utilization. However, the radical ownership remains in the Traditional Authority (Section 4.7.1. National Land Policy, 2002)".

So the GVH is the delegated owner of the land and has in his capacity the right to sign the contract and the rights to the carbon credits to BERL since he is the delegated legal owner of the land.

A digital sample of such a contract is attached in Annex 1. In the first planting season over a 1000 clubs registered. For all the area included under those clubs, contracts are available at the main office of BERL in Lilongwe. The rights to the carbon credits rest with BERL.

New instances must be covered by the same type of contract as the 1st instance.

1.12.2 Emissions Trading Programs and Other Binding Limits

This project is not participating in an emissions trading program.

New instances may not be participating in an emissions trading program.

1.12.3 Participation under Other GHG Programs

This project has not applied for registration under other GHG programmes.

New instances may not have been part of a project that has applied for registration under other GHG programmes.

1.12.4 Other Forms of Environmental Credit

The biological sequestration of carbon dioxide through the planting of Jatropha in the proposed project activity has not created any other form of environmental credit aside from the carbon credits to be generated through the implementation of this project. The application for voluntary carbon units (VCU's), under the ARR category of the VCS AFOLU program is the only form of credit being sought.

The project activity is not located in an area covered by a regulatory GHG program.

New instances may not have created any other form of environmental credit aside from carbon credits generated through this project and may not be located in an area covered by a regulatory GHG programme.

1.12.5 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG program.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The criteria that new instances of the project activity must meet to be eligible for addition to the grouped project at subsequent verification events are in summary the following[4]:

Table 6: Criteria for New Instances

	Criterion	Required Evidence	Means of Verification
1 1.1	New instances must meet the applicability criteria of the applied methodology: 1. The project activity does not lead to a shift of pre-project activities outside the project boundary, i.e., the land under the proposed	Only hedgerows are planted and only around agricultural fields.	Maps, GIS database and field samples

[4] Some of the eligibility criteria for the addition of new instances of the project activity have been indicated throughout this document at the end of each section where it is appropriate but all of them are listed here.

	A/R CDM project activity can continue to provide at least the same amount of goods and services as in the absence of the project activity;		
1.2	2. Lands to be afforested or reforested are degraded, or degrading and it may be expected that the land would remain degraded in the absence of the project activity;	The planting with Jatropha only occurs within the targeted expansion areas as indicated in this PD.	Maps, GIS database and field samples showing that planting only occurs in targeted expansion areas.
1.3	3. Environmental conditions and human-caused degradation do not permit the encroachment of natural forest vegetation;	The planting with Jatropha only occurs within the targeted expansion areas as indicated in this PD for which it has already been demonstrated that the normal land management practice is burning.	The state of the soil degradation of these targeted expansion areas is sustained by the DSOER. Maps, GIS database and field samples showing that planting only occurs in targeted expansion areas
1.4	4. Soil organic carbon pool may be conservatively neglected in the proposed A/R CDM project activity;	The project does account for soil organic carbon and future instances are allowed to do the same.	
1.5	5. Carbon stocks in litter and deadwood can be expected to decrease more due to human intervention or increase less in the absence of the project activity, relative to the project scenario;	Future instances must follow the SOPs that determine that prunings, clippings, and removal of grasses during soil preparation are left on site.	Maps, GIS database and field samples showing that planting only occurs in targeted expansion areas Adherence to SOP 9.5, tested through a field sample
1.6	6. Flooding irrigation is not applied in the project activity.	Future instances must comply with the land eligibility criteria that determine that flooding irrigation is not allowed.	Adherence to land eligibility requirements, tested through checking documentation and a field sample
2	New instances must be located in Malawi and detailed boundary information of the "targeted expansion area" shall be provided	New instances shown on the map as being located inside Malawi	Map/ GIS data and database showing location of plantings of new instances
3	The new instances must be acts of re-vegetation of the same kind as in the validated project design	Only hedgerows are planted and only around agricultural fields.	Documentation, GIS database and field sample showing only hedgerows are planted around fields and that individual areas have a minimum size of 500 m^2.
4	Baseline condition of the new instances must be falling into the same category as those	New instances meet the land selection criteria set by the project	Documentation and field sample demonstrating that plantings are in compliance

	included in the initial instance		with land selection criteria; adhering to SOP 6.2 Land / Site Selection Criteria)
5	Future instances are initiated under the same additionality conditions	Continuation of the pre-project land use is the baseline scenario for the future instance	Documentation and field sample demonstrating that plantings are in compliance with land selection criteria adhering to SOP 6.2 Land / Site Selection Criteria
6	The acts of re-vegetation of new instances do not lead to any leakage	Only hedgerows are planted and only around agricultural fields	Documentation, GIS data and field sample demonstrating that plantings are in compliance with land selection criteria adhering to SOP 6.2 Land / Site Selection Criteria
7	The quantification of emissions and removals are in line with the methodology that is applied and such methods are appropriate	The quantification is based on the premise that only hedgerows are planted and only around agricultural fields; the trees are planted and maintained following the appropriate SOPs; and the plantings are subject to the validated monitoring plan.	The monitoring plan must be implemented appropriately and the results of the monitoring exercise preceding the verification are used appropriately in the spreadsheet to calculate the emissions/removals; the spreadsheet must be used correctly using the right numbers coming out of the monitoring campaign.
8	Environmental impacts do not exceed those of the original instance	Only hedgerows are planted and only around agricultural fields; the trees are planted and maintained following the appropriate SOPs; pests and diseases and fire are monitored according to the appropriate SOPs and as validated in the initial PD.	Documentation and field sample demonstrating that plantings are in compliance with land selection criteria and evidence that the area of the new instance is covered by the EIA certificate issued by the GoM.
9	Stakeholders are involved in the same manner as in the original instance	BERL continues to work with stakeholders as it does during the validation of the initial project design; verifiable evidence and records are being kept of such stakeholder consultation meetings; any possible comments made by stakeholders are taken seriously and are addressed properly.	Records of meetings with stakeholders are kept and concerns appropriately addressed.
10	Non- permanence risk factors that are valid for new instances do not in total exceed the risk rating as determined for the original instance	Scores do not exceed the following: **Risk rating** / **Percent** Internal Risk / 13% External Risk / 2%	Verify through a risk assessment preceding each following verification that the total risk rating is not exceeding the score in this PD.

		Natural Risk	5.5%	
		Total Risk rating	**20.5%**	

Leakage Management

Not applicable

Commercially Sensitive Information

No information has been excluded. There is no commercially sensitive information in this PD that may not be disclosed to third parties or the public.

Further Information

The project is eligible as a VCS AFOLU ARR project, establishing a vegetative cover through the planting of woody vegetation to increase carbon stocks in woody biomass and soil. The project applies an approved consolidated A/R CDM baseline and monitoring methodology (AR-ACM0002), which is applicable to the project's design and conditions (Section 2.2).

The project is additional (Section 2.5) and it meets all the host country's legal requirements (Section 1.10). Remote sensing/satellite images demonstrate that for at least the past 10 years, there was no forest in the planted areas (Section 1.8). Without the project this vegetative cover would not have been established (Section 1.8).

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

AR-ACM0002 "Afforestation or reforestation of degraded land without displacement of pre-project activities." (Version 01; http://cdm.unfccc.int). In this chapter, all text that is printed in *italics* is cited from AR-ACM0002, unless otherwise stated. This methodology represents a number of simplifications that can be assumed to be valid for a specific project activity as per its applicability conditions. The methodology can be applied to the proposed ARR project activity as justified in Section 2.2 below and as confirmed by the VCS in writing to the project developers and the validators on 17 November 2010.

New instances must apply the same methodology.

2.2 Applicability of Methodology

The proposed project activity uses the CDM-approved consolidated afforestation and reforestation baseline and monitoring methodology AR-ACM0002: "Afforestation or reforestation of degraded land without displacement of pre-project activities."(Version 01)

This methodology has been chosen due to its applicability to the proposed project activity, as detailed below. Where necessary, the relevant tool has been applied to ensure applicability of the project activity.

Applicability condition 1 (AR-ACM0002/version 01, Section 4, page 2):

> *"The project activity does not lead to a shift of pre-project activities outside the project boundary, i.e., the land under the proposed A/R CDM project activity can continue to provide at least the same amount of goods and services as in the absence of the project activity"*

Justification:

The project plants hedgerows on degraded, derelict land, around homesteads, or along the boundary of agricultural fields. The hedgerows will take a maximum of 3 m width at maturity and are not planted as an alternative to food crops.

The 1st years after planting, in the case of planting the hedgerow around agricultural fields, crops can be grown on either side of the hedgerow. Once the Jatropha reaches one year, it starts to bear fruit and will generate income for the farmer. The Jatropha is expected to mature in year 7, at which stage they will cover a 3-m width.

Due to the above, no shifting of pre-project activities occurs.

When new instances are added under this Grouped Project in future, all areas of such a new instance must meet this applicability: no leakage.

Applicability condition 2 (AR-ACM0002/version 01, Section 4, page 2):

> *"Lands to be afforested or reforested are degraded or degrading and it may be expected that the land would remain degraded in the absence of the project activity";*

Justification:

The project area is scattered throughout various districts in Malawi (see SOP 3.1 BERL Operational Areas and Districts v.1.2). As indicated in Sections 1.9 the land is degrading. This is demonstrated by using reports on the environmental state of the districts that have researched soil fertility and or land degradation (see below). This is in line with the "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities," which states that evidence shall be provided by the project that the area has been classified as "degraded" or "degrading" under verifiable local, regional, national or international land classification system or peer-review study, participatory rural appraisal, satellite imagery and/or photographic evidence in the last 10 years.

Further, more locally based evidence that the land is degrading is the traditional slash and burn practice in Malawian smallholder farming: traditionally shifting cultivation is practiced, with soil fertility being rejuvenated by long fallow periods. However, pressure from rapidly increasing population has reduced fallow periods or led to continuous cultivation with little or no added external inputs. This has led to widespread soil degradation, indicated by high levels of erosion and reduced crop yields of which evidence is presented by the District State of the Environment Reports (DSOER, 2004[5]).

The persistent land degradation caused by the traditional slash and burn practice of the local population is demonstrated in Section 1.9 in the section on fire. Information on land degradation is also obtained during the initial assessment of land eligibility: for each parcel of land a questionnaire is completed (see annex 2) and the farmer is asked several questions related to his or her land management practices (slash and burn and the productivity of the land). Hence, for each parcel of land a record is being kept logging data related to the status of the land.

DSOER: District State of the Environment Reports of Malawi

A District State of the Environment Report (DSOER, 2004) is available for most districts of Malawi, including information on soil and environmental resources. These district reports are available for verification in hard copy or in soft copy in BERL's Lilongwe office. Information regarding the status of soil resources for some of the districts within the project area are summarized below.

Mzimba

Most land in Mzimba is degraded through soil loss due to erosion. Without significant fertilizer application, farmers do not yield meaningful crop harvests. Soil erosion is thought to be caused and aggravated by deforestation and poor farming practices, mostly in the areas of Mzikubola, Kampingo, M'mbelwa,

[5] Districts are, since the Environmental Management Act was approved in 1996, mandated to produce a State of Environment Report every two years to monitor the environmental state of the district.

Mabilabo and all urban and semi-urban centres in the district. Many rivers in the district are consequently drying up due to silt load.

The nutrient status of most soils of the district at present under cultivation is low with widespread and multiple mineral deficiencies. The structure of most cultivated topsoils is poor, due to poor cultivation practices, which results in disintegration of soil crumbs.

The soils are therefore highly erodible, and both sheet and gully erosion is rife in many areas of the district especially areas with high elevation. Table 7 below shows that most of Mzimba's soils suffer from multiple nutrient deficiencies, which means the application of inorganic fertilizers alone is not adequate to restore soil function.

Table 7: Soil sampling site % showing nutrient defiant levels

RDP	SUB RDP	Zn	Cu	Ca	Mg	K	P
Mzimba	Mzimba Central	65	4	42	59	20	50
	Mzimba South	87	9	69	51	43	59
National Mean		**49**	**6.1**	**24**	**14**	**13**	**44**

Kasungu

Most of the soils in the district are ferralic and chronic Cumbisoils characterized by sand clay loam and sandy soils such that they are inherently low in nitrogen and phosphorus. Mono cropping, which is being practiced by many farmers, leads to further depletion of already scarce resources and as such there is little time for replacement of soil nutrients, leading to gradual exhaustion of the soils.

In Kasungu district, soil erosion is mainly by rainwater. Bare hills found throughout the district discharge rainwater, which carries loose or exposed soil with it down the slope. This soil erosion can be correlated with soil fertility. The presence of soil erosion negatively affects the soil fertility because of the physical removal of nutrient rich topsoil.

The district uses the following indicators of extensive soil erosion:

- Poor and stunted growth of crops
- Presence of rills and gullies
- Presence of sub soil, pebbles and stones

Nkhotakota

Nkhotakota faces a potentially serious land degradation problem arising from the current impoverishment of its agricultural land through inappropriate land use, inadequate conservation practices, deforestation and encroachment of farming on marginal lands and other environmentally fragile areas. The latter include steep slopes, shallow soils, stream banks and areas of prolonged water logging soil erosion. Erosion is estimated at 20 tonnes per hectare per year, contributing to mean yield losses of between 4% and 11% per year, which is the most serious threat to sustained agricultural productivity (Bvumbwe Reserve, 1990).

Due to high population growth rates and the resultant fragmentation of land holdings, agriculture is characterised by a lack of fallow period, short rotations and non-utilization of organic matter. This has led to declining soil fertility and low crop yields. Use of inorganic fertilizers is low due to high prices.

Soil fertility improvement programs in the district aim to promote research, agro-forestry practices, utilization of crop residues, animal manure, compost manure, crop rotation, short-term fallows and intercropping with legumes.

Dedza

The following are highlighted as indicators of degrading soil resources for the district:

- Soil Erosion
- Low soil fertility

- Declining land holding size

Dedza uses the number of gullies and the siltation of rivers as indicators of the extent of erosion.

Table 8: Number of gullies increasing from 1995 to 1998

Year	Mtakataka	Lobi	Linthipe	Kanyama	Bembeke	Kaphuka	Mayani
1995-96	329	403	10	42	18	42	87
1996-97	365	448	1	47	22	47	71
1997-98	406	498	12	53	26	53	58
1998-99	451	553	12	59	31	59	48
1999-2000	501	615	14	61	38	61	39

Table 9: Number of silted rivers from 1995 to 2000

Year	Mtakataka	Lobi	Linthipe	Kaphuka
1995-96	2	4	2	5
1996-97	2	4	2	6
1997-98	4	4	0	7
1998-99	5	4	2	8
1999-2000	6	4	2	9

Mangochi

Soil erosion has occurred continuously in almost every area of the district but the rate varied due to several factors like deforestation, sloping percentage, vegetative cover and crop land/field management. Although there are no data available at the District to show soil loss per unit area per year, it is quite evident through observations that an increase in soil erosion occurs. Some notable indicators are increase in development of gullies, siltation of rivers and lakes, reduction of topsoil depth, and collapsing of riverbanks.

Peer reviewed studies

A number of studies have been carried out indicating the status of degraded soils within Malawi. Most of the available studies are based on data from regional research stations. Recent studies (within the past 10 years) based on peer reviewed local, regional and national data are available, as are a number of older studies from the 1990s. Most evidence was collected during this period due to an increasing focus on food scarcity during these years. However, more recent documentation indicates that the factors that led to initial degradation are not only still present but are continuing to place further strain on land and soil resources, leading to a conclusion that the lands are considered “degraded” and “degrading”. This evidence is summarized below.

Approximately 80-85% of Malawi’s population is classified as rural. These populations are smallholder farmers who would have traditionally practiced shifting cultivation, with maize being the dominant crop. The past few decades have seen a consistent decrease in the annual production of maize, the majority of which comes from such smallholder production. Saka *et al.* (1995)[6] state that ‘low and declining soil fertility is the single most important factor responsible for reduced crop yields in the smallholder sector.

Historically, farmers would have utilized multiple fields, leaving each area of land fallow for a number of years to enable rejuvenation of the soils. However, in recent years, increasing population pressure has reduced the ability for shifting cultivation, and resulted in a more permanent form of smallholder agriculture. Being a small country with limited land resources, in recent years Malawi has suffered from decreasing levels of agricultural productivity and an increasing reliance on fertilizers. Date from the

[6] Saka A., Green R. & Ng’ong’ola D. 1995 *Proposed Soil Management Action Plan for Malawi,* ODA,WD,MAI, Lilongwe, Malawi (cited in Bishop (1996))

Chitedze Agricultural Research Center quantifies soil erosion at the national level to be around 20 t/ha/yr and account for mean yield losses of between 4-11% of maize per year[7].

Older data indicates that the problem of soil erosion and degrading soils has been ongoing in Malawi since at least mid last century. Studies carried out for the World Bank by Bishop (1996)[8] looked at national level data. Results of continuous maize trials at Chitedze Research Station, from 1955 to 1963 for six different treatments of crop residues, showed a mean decline of 49% over eight years for unfertilized maize, or a 9.1% average annual decline during the period (Dept. of Agr. Annual Report for 1962/63, pub. 1965 in Bishop 1996).

Bishop's studies use the physical loss of soil (in tonnes/ha) for measuring land degradation. The loss of soil can be a proxy for changes in factors such as soil nutrient content, soil pH and moisture. These results are therefore, included here to indicate the consistently high loss of physical soil across research stations in Malawi.

Table 10: Field Measurements of soil erosion, Malawi

Station	Source	Slope (%)	Mean Rainfall (mm/yr)	Plot Size (ha)	Crop Cover & Husbandry	Mean Soil Loss (t/ha/yr)
Bvumbwe	Amphlett 86	7.2	987	7.8	Physical structures and full land use plan	0.1
Mindawo	Amphlett 86	8.8	964	5.3	traditional cultivation	10.6
Mindawo II	Amphlett 86	8.1	1,032	6.7	physical structures & traditional cultivation	2.9
Mphezo	Chome 89	7.1	1,004	17.2	Eucalyptus plantation	0.1
Nkhande	Chome 89	44.0	1,300	0.02	Ridged maize	54.2
Nkhande	Chome 89	44.0	1,300	0.02	ridged maize alley cropped with leucaena	7.2
M'mbelwa	Machira 84	6.0	824	0.005	bare soil, unridged	11.2
M'mbelwa	Machira 84	6.0	824	0.005	Rhodes grass	2.8
M'mbelwa	Machira 84	6.0	824	0.005	maize, ridges along the slope	7.9
M'mbelwa	Machira 84	6.0	824	0.005	maize, ridges across the slope	1.2
Zunde	Kasambara 84	3.0	770	0.005	Bare soil, unridged	25.0
Zunde	Kasambara 84	3.0	770	0.005	Rhodes grass	2.3
Zunde	Kasambara 84	3.0	770	0.005	Maize, unridged	24.5
Zunde	Kasambara 84	3.0	770	0.005	maize, ridged	15.3
Bunda	Weil 82	6.0	886	0.0001	Maize, weeded	12.1
Bunda	Weil 82	6.0	886	0.0001	Maize, unweeded	4.5

Source: Bishop (1996)

[7] Chilimba A. 2001 "Vertisols Management in Malawi" in *The Sustainable Management of Vertisols (eds Syers J., Penningde Vries F. & Nyamudeza P.* CAB International

[8] Bishop J. 1996 *The on site cost of soil erosion in Malawi*

More recent studies (Chilimba, 2001) have obtained detailed results on the productivity of Malawi's soils, with an emphasis on vertisols. It is stated that under the current and increasing circumstance of low land availability and increasing population pressure, "smallholder agriculture in Malawi has caused a serious increase in soil erosion, surface runoff, nutrient depletion, overgrazing, deforestation, diminishing groundwater supplies and loss if biological diversity".

This author, carrying out research at the regional and national level for Chitedze Agricultural Research Station in Lilongwe, looked into the properties of vertisols as one of the most fertile soils for agricultural production in Malawi. Background documentation indicates that less than 2.2% of Malawi's land area is covered by vertisols (known by the regional name as 'black cotton soils') that show the following properties:

- Soil reaction: slightly alkaline (pH 7.0-8.5)
- Total nitrogen: medium (0.12-0.25%)
- Available phosphorus: low to medium (< 8mg/kg)
- Exchangeable potassium: medium to high (0.8-1.0cmol(+)/kg)
- Cation exchange capacity: medium to high (10-20cmol(+)/kg)
- Exchangeable sodium: high (20-50%)
- Salinity: low (2-4mS/cm)

Table 11: Soil analytical data for two soil profiles of Vertisols (Mphonde) in Shire Valley Agricultural Development Division.

Depth (cm)	pH	Silt (%)	Clay (%)	Texture	%C	S (mg kg^{-1})	P (mg kg^{-1})	K (cmol (+) kg^{-1})	Na (cmol (+) kg^{-1})	Ca (cmol (+) kg^{-1}	Mg (cmo l(+) kg^{-1}
0-15	7.5	10	58	Clay	1.49	0	8	0.60	0.36	43.8	8.11
15-30	7.5	10	57	Clay	0.98	11	5	0.70	0.52	59.4	8.32
30-45	7.6	10	60	Clay	0.95	6	3	0.47	0.56	46.9	9.15
0-15	7.5	9	53	Clay	1.64	2	3	0.60	0.33	48.8	7.07
15-30	7.5	8	58	Clay	1.01	27	3	0.60	0.38	56.3	7.45
30-45	7.5	12	51	Clay	0.85	2	3	0.68	0.42	51.3	7.90

Source: Panje (1979), Cited in Chilimba (2001)

However, despite having relatively good nutrient content, these soils suffer from being poorly drained and having a sandy clay to clay texture, limiting their ability to maintain water adequately. Rather they become hard and cracked during the dry season and sticky and flooded during the wet.

Chilimba's research concludes that "most of Malawi's soils are degraded and the soils that remain fertile are the vertisols". However, even within these small areas of vertisols, "high levels of crop yields are seldom reached due to various limitations such as tillage difficulties, low infiltration rates and permeability and nutrient deficiencies" and that changes in management practices are required to prevent further degradation of these soils.

Applicability condition 3 (AR-ACM0002/version 01, Section 4, page 2):

> *"Environmental conditions and human-caused degradation do not permit the encroachment of natural forest vegetation;"*

Justification:

Encroachment of natural forest vegetation is unlikely to occur due to:

- The annual burning of agricultural land in the project area
- Various processes causing an overall reduction of forest vegetation

Natural forest growth in the business as usual scenario is impossible because the project is being carried out on areas that have been used as agricultural land in the past which are being burned annually. As demonstrated in Section 1.7, annual burning of the vegetation further contributes to wearing out the soils and the natural vegetation.
The AER (2009) states in this respect that: "the country continues to suffer from forest degradation largely because of poverty, population growth, agricultural expansion, infra-structural development and over dependency on wood fuel for energy. Over 93% of the population depends on biomass energy for heating and lighting. It is estimated that forest resources in Malawi are declining at a very alarming rate of 2.6% per annum. The decline in the resource is attributed to deforestation." (AER, 2009, paragraph 3.2.2.2) "Biomass satisfies about 83.4% of household energy demand … principally firewood (80%), charcoal (8.8%) and crop and industrial residues (11.2%). However, since it takes 9 tonnes of firewood to produce 1 tonne of charcoal, the use of wood is significantly greater in the charcoal burning households than in the firewood households. This, therefore, leaves the country reliant on wood fuels. The continued destruction of forests has resulted in reduced capacities for forests to provide the desired goods and services in the country." (AER, 2009, paragraph 3.2.2.3)

Applicability condition 4 (AR-ACM0002/version 01, Section 4, page 2):

> *"Soil organic carbon pool may be conservatively neglected in the proposed A/R CDM project activity;"*

Justification:
The "Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities" has been applied. The project area fulfils the applicability criteria of this tool:

1. No organic soils are included within the project area;
2. Soil erosion in the project scenario shall not increase carbon stocks above the baseline rates:
   i. Land clearance by slash-and-burn activities is a common practice in the baseline scenario. Removal of vegetation for site preparation is not necessary in the case of planting hedgerows around existing fields. Existing vegetation is shown through the use of fire maps to be very low or non-existent.
   ii. Pits are dug by hand, and soil disturbance does not exceed 10% of the project area.
   iii. Ploughing/ripping/scarification is not used for land preparation
3. All fine litter will remain on site (see SOP 7.3 Land Preparation v.1.2, SOP 8.1.1 Weeding v.1.1 and SOP 8.1.4 Fire protection v.1.1).

The tool states that changes in the carbon stocks of the mineral soil component of the soil organic carbon pool may be conservatively neglected in CDM A/R projects, during the calculation of net GHG removals by sinks, when the baseline carbon stock in mineral soils within the project boundary is:

- In decline
- At steady-state or quasi-steady-state
- Increasing at a rate less than or equal to the rate expected under the project activity

These conditions are satisfied by the proposed project activity as the areas to be used for re-vegetation are only covered by grasses and shrubs, which are burned each year. The project will establish a permanent vegetation cover.

Applicability condition 5 (AR-ACM0002/version 01, Section 4, page 2):

> *"Carbon stocks in litter and deadwood can be expected to decrease more due to human intervention or increase less in the absence of the project activity, relative to the project scenario;"*

Justification:
Negligible amounts of litter and deadwood are forming in the baseline scenario due to fire and general lack of vegetation cover, whilst the litter and deadwood pools in the project scenario will increase over time (see SOP 8.1.1 Weeding v.1.1, SOP 8.1.4 Fire protection v.1.1). Furthermore, the seed cake remaining after the oil extraction from the Jatropha nuts will be made available to the farmer used as a fertilizer within the project area, therefore increasing carbon stocks in a pool that is derived from litter.

Applicability condition 6 (AR-ACM0002/version 01, Section 4, page 2):

"Flooding irrigation is not applied in the project activity;"

Justification:
Flooding irrigation will not be applied within the project activities, in particular not because Jatropha is not very resistant to waterlogging.

When new instances are added under this Grouped Project in future, all areas of such a new instance must meet all of the applicability conditions.

2.3 Project Boundary

The methodology AR-ACM0002 states in Section II.1 on page 2 regarding "Project boundary and eligibility of land" that:

> *The "project boundary" geographically delineates the afforestation or reforestation project activity under the control of the project participants (PP's). The A/R CDM project activity may contain more than one discrete area of land. Each discrete area of land shall have a unique geographical identification.*

Each area of land planted under the proposed project activity has its own ID and is geo-referenced using GPS. The full database is kept at the BERL head office in Lilongwe. The clubs that have entered into a growers' contract with BERL in planting year 2008/09 and 2009/10 are mapped using GIS.

Use of GIS to Record Project Boundaries
By GPS techniques, specific geographical information of the project boundary, poly-lines (for hedges), are mapped indicating the location of all participating growers and grower clubs. In addition, GPS is employed, where necessary, to map management activities such as permanent sample plots for example.

Table 12: Description of Club ID, Grower ID and Plot ID

Club ID The Club ID is a unique number that can identify each club. The number is made up of the following details: – **(EPA)-(Club number)** The EPA is the Extension Planning Area (numbers originating from the Government of Malawi), and the club numbers are consecutive numbers given to the clubs as they register. So, for example, Club Mwaiwathu in EPA Chulu (208) has the Club ID of **208-33.**
Grower ID The Grower ID is a unique number that can identify each grower. The number is made up of the following details: – **(EPA)-(Club number)/(Grower's number)** Where: – EPA-Club number = the same number as the Club ID – Grower's number = the number next to the grower's name on the Club Details page of the FT Record Book (or C if the plot is communal)

So, for example, Grower number 2 of Club Mwaiwathu (33) in EPA Chulu (208) has the Grower ID of **208-33/2.**

Plot ID
The Plot ID is a unique number that can identify each plot. The number is made up of the following details:

- **(EPA)-(Club number)/(Grower's number)/(Planting type) (Plot number)**

Where:
- EPA-Club number = the same number as the club ID
- Grower's number = the number next to the grower's name on the Club Details page of the FT Record Book (or C if the plot is communal)
- Planting type = "L" for line
- Plot number = the number given to the plot at registration (from the Line Planting Registration page of the FT Record Book).

So for example, Line number one of club 107-19, belonging to grower number 6 would have a unique identity of: **107-19/6/L1**

For 2009/2010 planting season the L stands for Lines.

The GPS uses the UTM system, e.g.: 36 L0578936 8454870. As 36 L applies to all BERL's areas, the FT's record the latitude and longitude numbers for each plot in the FT Record Book. So for example they write:

0578936

8454870

The single waypoints are also saved in the GPS, and labelled with the Grower's ID, so that this information can be cross-checked. For example:

998-144/03/L15 has the coordinates 36L 0567814 8591304

The information from the shape file is used to create a spreadsheet, which shows information for each plot. For each plot, the number of hedges that it is made up of (including the main line) and the total length and total area of the main line and hedges combined are given. The total area is used to ensure that the area of the plot is more than 500 m^2. A GIS script is then run to check whether any of these plots have hedges which are more than 5m away from the main line or another hedge. If there is a plot with a hedge more than 5m away, the entire plot is removed.

Future instances must use the same ID system.

GHG Sources, Sinks and Reservoirs
Selection and justification of carbon pools
The methodology calls for the following carbon pools to be included:

Carbon Pools	Selected	Justification
Above-ground	Yes	Major carbon pool subjected to project activity
Below-ground	Yes	Major carbon pool subjected to project activity
Dead wood	No	Conservative approach under applicability condition

Litter	No	Conservative approach under applicability condition
Soil organic carbon	Yes	The default approach is selected. The project is eligible for that because all conditions in Section 5.1.2 of AR-ACM0002 are satisfied

In Section 5.1.2, methodology AR-ACM0002 determines that project activities are eligible for accounting of the default changes in the soil organic carbon pool in all areas of land included in their boundary in case they satisfy all conditions listed below:

(a) The area does not include organic soils (e.g. peat-lands), or wetlands
(b) Removal of existing vegetation during site preparation for the A/R CDM[9] project activity shall not occur on more than 10% of the area, unless it can be demonstrated that land clearance, e.g., by slash-and-burn activities, is a common practice in the region in which the project is located
(c) Litter shall remain on site and not be removed
(d) Ploughing/ripping/scarification associated with site preparation for planting, seeding and/or the human-induced promotion of natural seed sources in the area of land, shall not exceed 10% of its area (during each occasion)
(e) If ploughing/ripping/scarification is used for site preparation, it shall follow the land contour

Therefore, using a conservative approach, the project activity accounts only for emission reductions created by net carbon sequestration in above and below ground carbon pools. For further justification of the exclusion of additional pools, see application of the relevant tools in Section 2.2.

New instances in future must include the same carbon pools.

Gases / emission sources to be included or excluded

The methodology considers CO_2 (accounted as changes in carbon stocks) and CH_4 emissions resulting from the burning of biomass as indicated in the Table reproduced below of the approved methodology.

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of Biomass	CO_2	Yes	Carbon stock decreases due to burning are accounted as a change in carbon stock
		CH_4	Yes	
		N_2O	No	Potential emissions are negligibly small
		Other	No	

No biomass burning occurs in the project scenario.

In addition, the CDM Executive Board made various decisions providing additional guidance. Such guidance has been adopted by the VCS.

At its 46th meeting (March 2009) the CDM Executive Board agreed with the guidance formulated by the AR Working Group at its 23rd meeting (February 2009) regarding conditions under which the changes in carbon stocks in existing live herbaceous vegetation can be considered insignificant. That guidance states the following:

> *"The A/R WG considered the request for clarifications, AR_AM_CLA_0006, regarding the GHGs emissions from removal of herbaceous vegetation. The A/R WG clarified that the changes in carbon stocks in herbaceous vegetation to the baseline net GHG removals by sinks is insignificant and shall be accounted for as zero.*

[9] Here and in following text copied from A/R methodologies, tools or CDM EB guidance, read 'ARR' for the purpose of this PD.

> *The A/R WG further clarified that the contribution of changes in carbon stocks and emissions of GHGs measured in CO_2 equivalents from any removal, including but not limited to burning, harvesting or decay, of herbaceous vegetation to the actual net greenhouse gas removals by sinks is insignificant and shall be accounted for as zero.*
> *In their decision, the A/R WG recognized that there are areas where the carbon stocks in herbaceous vegetation are large; but it was considered that, on average, the stocks would be insignificant in areas that are likely to be subject to an A/R activity."*

In addition, burning of biomass is a baseline practice that will be stopped within the project boundary once the project is being implemented, hence, omitting these emissions from the baseline leads to a conservative estimate of baseline emissions. In the project scenario, no burning of biomass is allowed and, therefore, related emissions are considered absent.
In paragraph 37 of the report of the 44th meeting of the CDM EB the Board agreed that:

> *the GHG emissions from the following sources related to A/R CDM project activities:*
> *(a) Fossil fuel combustion in A/R CDM project activities;*
> *(b) Collection of wood from non-renewable sources to be used for fencing of the project area; and*
> *(c) Nitrous oxide (N_2O) emissions from decomposition of litter and fine roots from N-fixing trees*
> *are insignificant in A/R CDM project activities and may therefore be neglected in A/R baseline and monitoring methodologies.*

Hence, emissions from the combustion of fossil fuel or nitrous oxide (N_2O) emissions from decomposition of litter and fine roots from N-fixing trees are not accounted for in the project case.

The above, therefore, limits pools and gases that must be taken into consideration to above and belowground biomass in the baseline and project case.

New instances must also refrain from using biomass burning in the project case.

2.4 Baseline Scenario

The methodology prescribes the 'Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities".

The share of hedges in the 1st two years of planting in terms of polylines is 85% and 95% respectively indicating that the share of fields or commercial growers is very low. As the hedges are mainly planted on boundaries of farmers' plots, it can reasonably be assumed that farming is not taking place on these marginal locations. Nevertheless, the baseline scenario assessment refers to these marginal locations as if alternative activities could be developed there.

Plausible baseline scenarios include:
a) Forestation / re-vegetation with Jatropha;
b) Commercial agriculture (e.g. tobacco or other cash crops);
c) Subsistence farming of e.g. maize or cassava, i.e. continuation of the pre-project land use;
d) Rehabilitation of degraded land.

All of the scenarios above are in compliance with all mandatory applicable legal and regulatory requirements: see Section 1.10 for a review of all applicable laws and regulations.

Re. a): All land planted belongs to smallholder farmers or in a limited number of cases are old tobacco fields. There is no tradition or current trend of establishing plantations or re-vegetation with Jatropha by the smallholders or the old tobacco estates. In addition, the land is degraded and, therefore, commercial forestry is not an economically interesting course of action and there are serious investment barriers as private capital is not obtainable from the capital market for this type of activity. There are also no legal

requirements for forest establishment. Therefore, this is rejected as a realistic baseline scenario. Re-vegetation with Jatropha is unlikely to occur without similar project-type infrastructure. In addition, the capacity to grow seedlings, the acquisition of seeds and training for establishment is provided by the project and would under this scenario not be available.

Re. b): As outlined in previous sections, the land is not suitable for growing crops on a commercial basis without significant amounts of fertilizer. The smallholders do not have the financial resources to apply fertilizer; nor do the tobacco growers. The latter have ceased to grow tobacco predominantly due to these to factors: the land is so degraded that even with large quantities of fertilizer the yield is not sufficient to justify the investment. Therefore, this is rejected as a realistic baseline scenario.

Re. c): This is the BAU scenario keeping in mind that the hedgerows are located at the margins of the agricultural plots. There are no barriers to continuation of this land use.

Re. d): Rehabilitation of degraded land can be achieved by assisting the natural vegetation to re-establish either through planting with indigenous species or by protecting it from fire. As illustrated in Section 1.7, burning of the land is a culturally strongly embedded habit that has not been tempered to date, nor is it likely that smallholders would suddenly change that habit, in particular since clearing the land, if they would ever intend to use it again, will require more effort then. Therefore, this is also rejected as a realistic baseline scenario.

Table 13: Matrix showing which barriers apply to which scenario

Barriers	Scenario A Re-vegetation with Jatropha	Scenario B Commercial Agriculture	Scenario C Subsistence Farming (BAU)	Scenario D Rehabilitation of degraded land
Investment Barrier	Y	Y		
Technological barrier (lack of access to necessary materials etc.)	Y	Y		
Barriers related to local tradition	Y			Y
Barriers due to prevailing practice	Y			Y
Barriers due to local ecological conditions (for forestation)		Y	Y	
Barriers due to social conditions, e.g. land pressure (for forestation)	Y	Y		

2.5 Additionality

According to VCS Standard v3.0, *"the determination of baseline scenario and demonstration of additionality are based upon the initial project activity instances. The initial project activity instances are those that are included in the project description at validation and shall include all project activity instances currently implemented on the issue date of the project description. The initial project activity instances may also include any planned instances of the project activity that have been planned and developed to a sufficient level of detail to enable their assessment at validation. Geographic areas with no initial project activity instances shall not be included in the project unless it can be demonstrated that such areas are subject to the same (or at least as conservative) baseline scenario and rationale for the demonstration of additionality as a geographic area that does include initial project activity instances."*

The proposed grouped project involves the districts Rumphi, Mzimba, Kasungu, Nkhotakota, Dowa, Salima, Ntcheu/Dedza, Machinga, Mangochi and Lilongwe. These districts have similar baseline conditions and therefore they will all be included in the additionality assessment despite the fact that not all of them have instances that are subject to the validation of this PD. Moreover, the proposed project forms part of a linked investment that is separated for purposes of VCS development but economically and organisationally connected. The project proponent will develop a biodiesel component for which it intends to acquire carbon credits. The arguments presented in this section are related to the entire investment chain as they cannot reasonably be separated.

The project qualifies as additional as is demonstrated in this section applying the "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (Version 01). All four steps of the Tool (Step 0 – Preliminary screening based on the starting date, Step 1 - Identification of alternative land use scenarios, (Step 2 is omitted), Step 3 – Barrier Analysis, and Step 4 - Common Practice) are met by the project.

There are several parties involved in the project:

- Smallholder farmers and commercial growers who are planting Jatropha on their plots and enter into a contract farming arrangement with BERL (SOP 6.4 Registration of Clubs / Signing the Contract v.1.1)
- BERL as the project proponent, organizer of the scheme and off-taker of the Jatropha seeds
- TNT as main investor in BERL.

The additionality argument can most suitably be made from the perspective of TNT. Smallholder farmers and commercial growers plant Jatropha because they are supplied with the seeds and guaranteed an off-take by BERL. As long as the guaranteed off-take price is sufficiently attractive, they will invest time and resources in the planting and growing of Jatropha, regardless of whether the payment is financed from carbon credits or other sources. BERL is the promoter of the scheme and takes financial responsibility for the project. However, with its own devices it is unable to pursue the project at a commercial scale. Only through the involvement of a strong partner like TNT as investor is BERL able to realize its plantation objectives. TNT's involvement and willingness to commit resources to BERL is directly linked to the prospect of receiving carbon credits as demonstrated in the paragraphs below.

In summary, the project is additional because:

- The prospect of receiving carbon revenues has been a determining factor in the decision to implement the project (Demonstration of serious consideration of carbon revenues prior to project start)
- The project is not economically attractive if it were not for carbon revenues
- The project faces barriers to implementation that are relieved by carbon revenues
- The implementation of at least one alternative to the project is not affected by the identified barriers (i.e. leaving the land barren)
- No projects comparable to the proposed project activity exist in the country

STEP 0. Preliminary screening based on the starting date of the A/R project activity

The starting date of the project was 8 July 2008, on which date the TNT board committed to providing finance for BERL. This date was the kick-off for the Jatropha planting and the ensuing processing of Jatropha oil. The starting date lies before starting validation of the project's first component, the planting. However, all project participants involved considered the incentives from carbon finance long before the starting date, as shown in

Table 14.

Table 14: Project development timeline

Date	Milestone
June 2006	Establishment of BERL by Malawian entrepreneurs
June 2007	First contact between TNT and BERL
October 2007	TNT commissions Deloitte & Touche for a first investigation of the carbon potential of the activities of BERL
February 2008	Finalisation of the study by Deloitte & Touche, presentations delivered on the use of CDM in Malawi and the development of BERL.
April 2008	TNT commissions Climate Focus and Treeness Consult to investigate the carbon potential of the BERL Jatropha Biofuel Project in Malawi
June 2008	Climate Focus and Treeness Consult deliver the report to TNT and advise to develop the carbon asset to strengthen the business model of BERL
8 July 2008	The TNT Board decides to invest in BERL and makes available funding to start planting

Documented evidence that project participants considered the incentives from carbon finance prior to the project starting date include:

- Presentation to the board of TNT on Jatropha plantations & Biofuel project activity in Malawi (February 2008)
- Presentation to the board of TNT on the development of BERL (February 2008)
- Contract between TNT and Climate Focus/Treeness Consult on determining the possibilities of carbon finance of the BERL Jatropha Biofuel Project in Malawi
- Phase 1 report of Climate Focus/Treeness Consult on the carbon potential of the BERL Jatropha Biofuel Project in Malawi
- Minutes of meeting of TNT Board meeting 8 July 2008

Ever since the project starting date, project participants have engaged in continuous and real action to secure the carbon finance of the Project, as is demonstrated in Table 15.

Table 15: Activities to secure carbon finance as from the project starting date.

Date	Milestone
4 September 2008	BERL assigns Climate Focus and Treeness Consult to develop the carbon asset of the Jatropha Biodiesel Project
October 2008	Biodiversity study conducted
December 2008/January 2009	Environmental Impact Assessment carried out
April 2009	Fire study conducted
2009-2010	Various visits by Silvestrum (successor of Treeness Consult) for development of project structure and PD preparation
September 2010	Foreseen start of the validation

STEP 1. Identification of Alternative Land Use Scenarios

Sub-step 1a: Define alternatives to the project activity

The Project involves the cultivation of Jatropha curcas for biofuel production, distribution and consumption. The realistic and credible alternatives available to the project participants (participants including BERL, farmers and biodiesel consumers) include the following:

- A The proposed project activity
- B Commercial agriculture (e.g. tobacco or other cash crops)
- C Subsistence farming of e.g. maize or cassava (BAU)
- D Rehabilitation of degraded land

Sub-step 1b: Consistency with mandatory laws and regulations

The project is entirely voluntary and not implemented in response to any enforced law, statute or other regulatory framework. The planting of Jatropha meets all applicable laws and regulations.

Sub-step 1c. Selection of the baseline scenario

The baseline methodology provides a stepwise approach justifying the selection and determination of the most plausible baseline scenario. Please see Section 2.4.

STEP 2. Investment Analysis

This step is omitted as the additionality argument is based on the barrier analysis.

STEP 3. Barrier Analysis

The project faces both investment and technological barriers as detailed in the sub-steps below.

Sub-step 3a: Barriers that would prevent implementation of the project activity

Investment Barrier

For the investment analysis of the project, the entire Jatropha biofuel production chain has to be considered. Investment in Jatropha plantations are undertaken in view of producing biofuel from the harvested seeds and selling the biofuel to transport or stationary applications in Malawi.

The biggest hurdle for a business venture like BERL's is to convince investors of the profitability and attractiveness of the investment. The nature of the business is highly uncertain as it relies on successful cooperation with thousands of farmers and crucial assumptions on planting successes and yield expectations from Jatropha trees, which are as yet unknown. Profits are highly uncertain and the business model operates with many unknowns. Added to that are the complexities of doing business in a sub-Saharan Least Developed Country like Malawi.

Lack of access to finance – BERL's history

BERL was established in June 2006 by Malawian entrepreneurs with the aim of cultivating Jatropha in Malawi and refining the seed oil into biofuel. As a start-up company with no significant capital base or precedent operations, BERL however was unsuccessful in arranging financing and was rejected by all regular loan providers in Malawi. Reasons stated are the long lead-time of the operation (Jatropha takes five years to grow to maturity; yield in first years is very low), the riskiness of the business and the non-availability of irrevocable letters of undertaking from reputable off-takers.[10]

Capital from international capital markets was also not available to BERL due to Malawi's general unattractiveness to private sector investors. The country ranks 134 in the World Bank's Easiness of Doing Business ranking, which is in the lower 25% of the list. The rating of the Malawi government by Fitch is B-/Stable, six grades below investment grade. The country is not rated by Standard and Poor's, which also

[10] Rejection letters are available from First Merchant Bank and Ecobank, both based in Lilongwe.

shows that the country is not on the radar for private sector investors. BERL's prospects to access capital from international sources is extremely poor given Malawi's dire situation as a Least Developed Country with no precedent or infrastructure suitable for such investments and the risks associated with a start up company without balance sheet or credentials.

Only when TNT approached BERL, TNT which has been active in Malawi through its partnership with the World Food Program, financing could be secured. TNT decided to make an equity investment in BERL and provided the necessary funds for the development of the project. Expected carbon credits from the project were an important driver for TNT to invest in the project, both for the monetary and the non-monetary impacts.

Importance of carbon credits to TNT
TNT is an international mail and express company. TNT also is a socially responsible company and works with international organisations to make a difference in combating poverty and improving the environment through its Moving the World initiative. It is an active partner of the United Nations World Food Programme (WFP), supporting WFP in different areas with its corporate and logistical capacity. Since 2002 TNT has been working together with the WFP to relieve famine and poverty in Malawi.

Another part of TNT's corporate social responsibility is the ambition to become climate neutral. As a transport company dependent on fossil fuels to power the air and road fleet, carbon dioxide emissions have been identified as TNT's most significant environmental impact. As from 2012, TNT's aircraft fleet in Europe will be subject to emission restrictions following the inclusion of the aviation sector in the EU Emissions Trading Scheme. Investment in BERL provides TNT with an opportunity to offset its transport emissions within its own network. While this afforestation project results in voluntary credits and hence can only be used towards TNT's social responsibility goals but not towards meeting the targets under the EU ETS, TNT is looking at the potential for generation of compliance credits from the biofuel component and future related activities. The project can serve as a trial operation for TNT to gain experience with carbon market projects and potentially be replicated in other countries where TNT is active. Biofuel is a particularly suitable offset category as it is one of the key technologies to reduce emissions from transport.

The investment in BERL brings together the two aspects of TNT's corporate social responsibility. On the one hand BERL brings a new additional cash crop to Malawi, which provides an additional stable income for the participating farmers and thereby helps to fight the root causes of famine. On the other hand, the investment into BERL provides TNT with access to tracked and traced carbon credits that are a direct result of the company's own efforts (as opposed to buying anonymous carbon credits from the market). The prospect of developing carbon credits within the own company was one of the major drivers behind the decision of TNT to invest in BERL.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

Alternative C (BAU) – Continuation of the BAU scenario does not face an investment barrier, because the market for local produce is established. The alternative is not affected by any technological barrier. Because this is common practice, all technology and organisation needed is in place.

STEP 4. Common Practice Analysis

Commercial-scale Jatropha plantations for the production of biofuel do not yet exist in Malawi. Jatropha has been known in Malawi for generations. It has been planted as hedges (mainly in Dedza and Ntcheu Districts) or has been used for artisan soap production or medicinal purposes. Due to investment barriers, larger-scale plantations are scarce, and the ones that exist are primarily aided by development organizations or donors.

In Malawi, the government has been slow moving in the stimulation of Jatropha plantation investments, leading to low technology transfer and a knowledge gap regarding the use of Jatropha products. This in

turn means that penetrating the market and selling the product to existing fuel stations is more difficult and more costly than in the rest of the region. Although Malawi has recently (2009) passed legislation on biofuels that could be applicable to Jatropha, most of the effort has gone into promoting ethanol production from sugar cane molasses. The country has not yet devised and implemented a comprehensive framework to specifically encourage investments Jatropha plantations.

According to the Global Exchange for Social Investment (GEXSI), around 1,500 ha are currently farmed with Jatropha, and several projects with a total current acreage of 4,500 ha are in the development stage. These are small-scale (average size of 375 ha), privately owned plantations, which require low upfront payments and less organisational effort. Some of these projects have also received aid, such as the Biodiesel Agriculture Association plantation (200 ha), which gives Malawian farmers the Jatropha trees to plant, hereby reducing a significant part of the necessary upfront investments. Another example includes The Malawi Agroforestry Extension Project (MAFE-project), which operates under a cooperative agreement between the Government of Malawi, USAID and the Washington State University, and also depends on donors. The initiative undertaken by BERL is by far the largest project in the pipeline (expected coverage of 21,363 ha by 2019), and relies solely on its own resources. The only comparable project is the plantation (5,000 ha) run by Stancom Tobacco, although this project currently has the status of a pilot scheme and has not yet arranged the finances and terms for a possible expansion.

What we see today and confirmed by the Biofuel Association that most of the planned projects did not take place due to lack of funding or otherwise. (BFA Statement) Currently we are aware of three larger Jatropha plantations in Malawi. One is located in Balaka in the South, exploited by Demeter Biofuels. Demeter is cooperating with D1 Oils on research on Jatropha. This estate is about 450 ha. The second estate is Tolima farm also located in Balaka and is about 40 ha. Third estate that we are aware of is 130 ha of Jatropha in Enkwendeni (Mzimba district), planted by Tropha Estates. There are also a number of NGO's active on a rural scale growing Jatropha for rural lighting but these are very small projects.

With regard to the existing activities on Jatropha planting in Malawi, we would like to state that the implementation of their activities cannot be compared to the BERL's existing activities. Based on their scale, none of the other parties are active in the 10 districts in Malawi. Secondly the other parties are only plantations commercially exploited and with a land use of old tobacco estates or agricultural land and sometimes even irrigated land like Demeter Fuel Crops. Thirdly no hedges are being planting by the mentioned parties only plantations.

The countries neighbouring Malawi have created more effective investment incentives for Jatropha plantation projects, resulting in rapid growth of planted land over the last several years. The largest acreage under cultivation currently exists in Madagascar and Zambia, with each about 35,000 ha, followed by Mozambique and Tanzania. Other African countries, like Cameroon, Ethiopia and Ghana, are actively encouraging foreign direct investment into biofuel production from Jatropha by facilitating land access, enabling bank loans, and offering tax incentives. Some governments also promote the sector by providing technical assistance for farmers. Some of the major projects in the region include:

Country	Project Developer	Ha (2008)	Ha (2015)
Madagascar	D1-BP Fuel Crops	-	-
Madagascar	GEM Biofuels	30,000	200,000
Madagascar	TOM Investment - MMF	500	100,000
Zambia	D1-BP Fuel Crops	25,525	-
Zambia	Marli Investments	8,500	21,000
Zambia	Sherriff Estates	10	2,000
Mozambique	Energem Mozambique	1,000	60,000
Mozambique	C3	1,000	-
Mozambique	EnerTerra	100	50,000
Tanzania	Diligent Energy Systems	3,000	200,000
Tanzania	Sun Biofuels	9,000	-

Source: Global Exchange for Social Investment, 2008.

Although the details behind the financial structures of these project activities are not publicly available, some project developers found it necessary to make use of public money to get the project running. One such example is the plantation run by Diligent Energy Systems, which received a considerable grant from a Dutch foundation for the realisation of the project.

Based on this analysis, the case for financial barrier for this project activity is strong. First, Malawi has a relatively weak incentive system for Jatropha plantation projects, compared to neighbouring countries that have taken a more proactive approach in facilitating similar project activities in operation. Second, the BERL project is by far the largest Jatropha plantation in Malawi, meaning that the costs and risks associated with land, planting, maintenance and technology use are of different scope when compared to the present small-scale Jatropha plantations that are currently operating in Malawi.

All new instances that may be added in future must be subjected to the same barriers as overcome here.

2.6 Methodology Deviations

Minor deviations from the methodology are applied in terms of *ex-ante* calculations of GHG removals, as well as monitoring of *ex-ante* parameters and establishment of allometric functions for Jatropha.

The verifiable changes in the carbon stock in aboveground biomass and below-ground biomass and soil organic carbon within the project boundary are estimated using Equation 11 of the methodology. Changes in carbon stocks in tree biomass are estimated on the basis of field measurements in permanent sample plots. Two methods are allowed by the methodology: the Biomass Expansion Factors (BEF) method and the Allometric Equations method.

The project determines allometric equations for the Jatropha trees on the basis of destructive sampling of specimens of different sizes. The above and below ground biomass is determined separately initially, after which a root-shoot ratio is determined to capture the biomass of the entire plant. It does not involve measurements of DBH but rather branches as low to the ground as possible.

Height will be measured in relation to the dimensions measured to determine the allometric equations.

More detailed information on the exact measurement procedures can be found in the monitoring section – *Section 3.3* - under subheadings *'selection of trees for destructive sampling*' and *'sampling tree components and their fresh weight determination'*. The strata that will be determined are based on the dimensions of the specimen. *Ex-post* monitoring of carbon sequestration will be based on sample plots whereby the allometric equation will be applied to the trees in the sample plot based on the tree dimensions, in accordance with Step 3 of the allometric equation method on page 13 of the methodology.

Deviations for the *ex-ante* estimates:
From Step 1 Allometric method: refers to Step 1 of BEF method - no measurements are taken at *DBH* but at stump height for each branch growing out of the stump.

From Step 2: Referring to Section II.8. Data/parameter *f*(*DBH,H*): in the section "Any comment" it is recommended to weigh only the AGB, but the project has taken initial measurements weighing both the above and belowground biomass. Hence, no root-shoot ratio is used either.

From Step 4: no conversion from AGB to BGB using a root-shoot ratio has been applied.

Deviations for the monitoring:
From Step 1 Allometric method: refers to step 1 of BEF method - no measurements are taken at DBH but at stump height for each branch growing out of the stump.

New instances may use the same deviations from the methodology, or, where appropriate, use information derived from earlier monitoring campaigns under this project; e.g. allometric equations that have been developed and that are demonstrably appropriate to be applied.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

In this methodology the baseline is determined *ex-ante* and remains fixed during the subsequent crediting period hence, the baseline is not monitored.

Under the applicability conditions of this methodology:

- Changes in carbon stock of above-ground and below-ground biomass of non tree vegetation may be conservatively assumed to be zero for all strata in the baseline scenario;
- Changes in carbon stock in soil organic carbon (SOC) may be conservatively assumed to be zero for all strata in the baseline scenario.

Therefore the baseline net GHG removals by sinks will be determined as:

$$\Delta C_{BSL} = \Delta C_{BSL,tree}$$

Where:

ΔC_{BSL}	Baseline net greenhouse gas removals by sinks; t CO_2-e
$\Delta C_{BSL,tree}$	Sum of the changes in carbon stocks in above-ground and below-ground biomass of trees in the baseline; t CO_2-e

In the baseline of this project there are no growing trees: hedgerows are planted on areas that have herbaceous vegetation (that can be excluded from accounting following an EB ruling) or no vegetation. If there are trees the planting of the hedgerow is interrupted or the hedge is planted around the existing trees. Therefore, $\Delta C_{BSL} = 0$.

3.2 Project Emissions

Actual net greenhouse gas removals by sinks are estimated as

$$\Delta C_{ACTUAL} = \Delta C_P - GHG_E$$

Estimation of changes in the carbon stocks

The sum of changes in the C stocks in all selected carbon pools and the loss of existing (pre-project) woody non-tree biomass due to site-preparation, and/or to competition from forest (or other vegetation) planted as part of the A/R CDM project activity in the project scenario (ΔC_P) is estimated as:

$$\Delta C_P = \sum_{t=1}^{t^*} (\Delta C_t \times 44/12 \times 1 year - E_{biomassLoss})$$

In this project $E_{biomassLoss}$ = 0 because no clearing, burning and decay of existing vegetation due to the implementation of the project activity takes place.

ΔC_t is estimated as:

$$\Delta C_t = \sum_{i=1}^{M_{PS}} (\Delta C_{AG,i,t} + \Delta C_{BG,i,t} + \Delta C_{d,SOC_t}) \qquad \text{(See section below)}$$

For the *ex-ante* estimation of ΔC_t no stratification has been applied.

Changes in C Stock in Tree Biomass

The project has applied and will apply in future the allometric method to determine the changes in carbon stocks.

At validation, $\Delta C_{AG,t}$ + $\Delta C_{BG,t}$ is taken from a combination of literature and site-specific data (Mponela 2009). The latter are based on the destructive sampling of 9 to 30 months old Jatropha trees (n=10), where no distinction was made between AG and BG. Hence, $\Delta C_{AG,t}$ + $\Delta C_{BG,t}$ are taken together while root:shoot ratio R_j (Equation 14 in AR-ACM0002) is set to zero. This is a deviation from the methodology Steps 1 through to 5, but only for the *ex-ante* estimations. A conservative table for $\Delta C_{(AG + BG,t)}$ has been constructed based on the above information, see Table 16.

No site-specific growth curves exist as of yet[11], but there are some rudimentary numbers on carbon contents, even though the IPCC does not provide any values in the Good Practice Guidance on Land Use, Land-Use Change and Forestry (2003).

The Organization of American States, in its Factsheet on Jatropha curcas for biodiesel production (2005), states that the quantity of biomass in each Jatropha plant after 7 years is approximately 200 kg, including roots. At a density of about 25% of dry matter this equals 25 kg carbon per tree at maturity (50 kg dry matter).

In the project scenario, for the *ex-ante* estimations we use the more conservative value of 5 kg C per mature specimen, excluding roots. Trees are assumed to reach maturity in seven years.

We assume the root-shoot ratio to be in the order of 0.25[12]. This value will be applied to *ex-post* estimations.

The growth model used comprises a linear increase in carbon stock to 6 kg C per tree in 7 years, after which no further increase occurs.

Table 16: Carbon stock in Jatropha used for *ex-ante* GHG estimation, and compared with site-specific data (Mponela 2009)

Age [yr]	Mponela Monoculture [kg C/tree]	*Ex-ante* model [kg C/tree]
1		0.9
1.25	1.0	
2		1.7
2.5	2.4	
3		2.6
4		3.4

[11] Growth curves for Jatropha will be created once pilots in preparation of the monitoring report have been completed. These pilots involve the destructive sampling of Jatropha trees at various sites.

[12] 0.27 in: Achten *et al.* 2010. Biomass production and allocation in *Jatropha curcas* L. seedlings under different levels of drought stress. (www.sciencedirect.com)

5		4.3
6		5.1
7		6.0

At verification, allometric equations will have been determined as a result of the monitoring campaign (see chapter 3 for a description how this will be done) and that will replace the *ex-ante* estimates based on Mponela and literature used here.

Also at verification, the implementation rate will be expressed on a per hectare per year basis. At validation, the schedule of the implementation rate is expressed in number of trees planted, as this unit is used by the management for the planning of the project. Given the standardized planting distances in line plantations, the values have a direct link to area. As the planning uses planting seasons that run from mid year to mid year, all plantings are conservatively allocated to the following calendar year, e.g. season 2008/2009 is treated as implementation year 2008. This is a deviation from the methodology steps 6 and 7.

Default Changes in Soil Organic Carbon Pool
For *ex-ante* and *ex-post* estimations, the changes in stocks of soil organic carbon in all eligible areas of land will be assessed using the default method as provided by the methodology. This means that the land has to meet the conditions listed in the methodology which is the case for all lands in this project: a) no organic soils or wetlands are included; b) no existing vegetation is removed on more than 10% of the area; c) litter and weeding debris remains on site; and, d) no ploughing/ripping/scarification is applied for site preparation, also not on slopes. Therefore, the soil organic carbon pools is estimated using formula 21 and 22 with the default values of 0.5 tC per hectare for ΔC and 20 years for $t_{equilibrium}$.

$\Delta C_{d,SOCt} = 0.5$ t C ha^{-1} yr^{-1} for $0 < t \leq t_{20}$

$\Delta C_{d,SOCt} = 0$ for $t > t_{20}$

These two equations are applicable to the entire project area.
Changes in carbon stock in soil organic matter shall not be monitored *ex post*.

Since in the default approach outlined in AR-ACM0002 SOC accumulation is to be estimated on a per ha basis, an estimate of planting area has been deduced from the number of trees that have been planted that are put forward during this validation, and the number of trees to be planted in the forecast up to year 2019.

The planting distance in the hedgerows is 1 m and the hedge will grow to be approximately 3 m wide, which makes the tree density 3333,3 specimens per hectare.

Estimation of GHG emissions within the project boundary
The only possible increase in GHG emissions as a result of the implementation of the proposed A/R CDM project activity within the project boundary is non-CO_2 GHG emission from biomass burning for site preparation and/or forest management. This is not occurring in this project and therefore, $GHG_E=0$.

Estimation of non-CO_2 emissions due to biomass burning of existing vegetation as part of site preparation
This is also not occurring in the project scenario.

3.3 Leakage

As per the applicability conditions for AR-ACM0002
$LK = 0$

3.4 Summary of GHG Emission Reductions and Removals

The net anthropogenic GHG removals by sinks is the actual net GHG removals by sinks minus the baseline net GHG removals by sinks minus leakage (formula 25 of the methodology). In this project both the baseline and leakage are zero and therefore, e*x-ante* estimates of the net anthropogenic project GHG removals are based on $\Delta C_{AG,t} + \Delta C_{BG,t}$ and $\Delta C_{d,SOCt}$. Carbon is converted to CO_2 by multiplying with 44 over 12. Project estimates for the entire project are provided in Table 17.

Table 17: GHG removals of the project case during the 30 years crediting period

Years	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)
2008	0	0	0	0
2009	0	4,474	0	4,474
2010	0	10,324	0	10,324
2011	0	25,467	0	25,467
2012	0	44,395	0	44,395
2013	0	67,108	0	67,108
2014	0	93,607	0	93,607
2015	0	123,892	0	123,892
2016	0	150,346	0	150,346
2017	0	175,622	0	175,622
2018	0	192,943	0	192,943
2019	0	207,022	0	207,022
2020	0	217,861	0	217,861
2021	0	195,174	0	195,174
2022	0	169,245	0	169,245
2023	0	143,317	0	143,317
2024	0	117,389	0	117,389
2025	0	91,460	0	91,460
2026	0	65,532	0	65,532
2027	0	39,604	0	39,604
2028	0	39,604	0	39,604
2029	0	38,960	0	38,960
2030	0	38,118	0	38,118
2031	0	35,940	0	35,940
2032	0	33,218	0	33,218
2033	0	29,950	0	29,950
2034	0	26,138	0	26,138
2035	0	21,782	0	21,782
2036	0	17,426	0	17,426
2037	0	13,069	0	13,069
2038	0	8,713	0	8,713
2039	0	4,356	0	4,356
Total	0	2,442,057	0	2,442,057

The buffer withholdings based on the non-permanence risk assessment are provided in Annex 7.

New instances must use the same methodology and apply it in the same manner as the first instance.

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	$A_{BSL,i}$
Data unit:	ha
Description:	Area of baseline stratum *i*
Source of data:	GPS coordinates
Value applied:	$A_{BSL,i}$ = 228.89 HA
Justification of choice of data or description of measurement methods and procedures applied:	Each hedgerow is recorded with the GPS as a line. With a software application this is converted in a polygon with the same length and a width of 3 m. The areas of all polygons are added up to form the baseline area.
Any comment:	N/A

Data Unit / Parameter:	CF_j, CF_{DS}
Data unit:	t C t^{-1} d.m.
Description:	Carbon fraction of dry matter for species of type *j*
Source of data:	IPCC Inventory guidelines. A default value 0.5 t C t^{-1} d.m. is used
Value applied:	0.5 t C t^{-1} d.m.
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	Carbon fraction of dry matter for dominant species *DS* when *j = DS*

Data Unit / Parameter:	$f_j(DBH, H)$
Data unit:	t d.m. $tree^{-1}$
Description:	Allometric equation for species *j* linking diameter at breast height (*DBH*) and possibly tree height (*H*) to above-ground biomass of living trees
Source of data:	Species-specific allometric equations will be generated using number of stems/branches as stump and total specimen height.

Value applied:	Parameter value not yet determined. Will be done during the monitoring campaign.
Justification of choice of data or description of measurement methods and procedures applied:	• Diameters of all trees in a plot are not measured at breast height, they are measured at 10cm distance from the base of the tree using callipers. See Section 2.6 Methodology Deviations. • Height of each of the trees in the plot measured from the base to the tip of a tree using calibrated tree measuring rods.
Any comment:	N/A

Data Unit / Parameter:	R_j
Data unit:	d.m. kg^{-1} d.m.
Description:	Root-shoot ratio appropriate for biomass stock, for species *j*
Source of data:	Field measurements: see Section 3.3.
Value applied:	Parameter value not yet determined. Will be determined when allometric equations are determined. In the *ex-ante* estimates information from existing sources are used and a limited amount of field measurements are taken. During these field measurements no distinction is made between AGB and BGB: the entire tree is weighed.
Justification of choice of data or description of measurement methods and procedures applied:	Field measurements: see Section 3.3.
Any comment:	

4.2 Data and Parameters Monitored

The following data and parameters will be collected, to complete the equations in the methodology:

Data Unit / Parameter:	A_i
Data unit:	Ha
Description:	Area of stratum *i*
Source of data:	Monitoring of strata and stand boundaries are done using GIS.
Description of measurement methods and procedures to be applied:	GPS recordings; method of handling in detail described in SOP 8.4 Mapping for Field Technicians and 8.5 GIS Processing.
Frequency of monitoring/recording:	N/A
Value applied:	228,89HA

Monitoring equipment:	GPS
QA/QC procedures to be applied:	Based on random plot verification
Calculation method:	N/A
Any comment:	N/A

Data Unit / Parameter:	A_{sp_i}
Data unit:	Ha
Description:	Total area of all sample plots in stratum *i*
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	GPS recordings; method of handling in detail described in SOP 8.4 Mapping for Field Technicians and 8.5 GIS Processing.
Frequency of monitoring/recording:	Dependent on verification interval: before each verification assessment a monitoring campaign will be held.
Value applied:	Not determined yet.
Monitoring equipment:	GPS
QA/QC procedures to be applied:	Based on random plot verification
Calculation method:	N/A
Any comment:	N/A

Data Unit / Parameter:	*DBH*
Data unit:	cm
Description:	Diameter breast height of tree
Source of data:	Field measurements in sample plots
Description of measurement methods and procedures to be applied:	• Diameters of all trees in a plot are not measured at breast height, they are measured at 10cm distance from the base of the tree using callipers. See Section 2.6 Methodology Deviations. • Height of each of the trees in the plot measured from the base to the tip of a tree using calibrated tree measuring rods.
Frequency of monitoring/recording:	Dependent on verification interval: before each verification assessment a monitoring campaign will be held.
Value applied:	Will be determined during monitoring campaign; see also deviations from methodology
Monitoring equipment:	Tree Calliper
QA/QC procedures to be applied:	Based on random plot verification
Calculation method:	N/A

Any comment:	Note: For *ex-ante* estimations, mean *DBH* and *H* values should be estimated for tree species *j* in stratum *i*, at time *t* using a growth model or yield table that gives the expected tree dimensions as a function of tree age.

Data Unit / Parameter:	*H*
Data unit:	m
Description:	Height of tree
Source of data:	Field measurements in sample plots
Description of measurement methods and procedures to be applied:	See DBH above
Frequency of monitoring/recording:	Dependent on verification interval: before each verification assessment a monitoring campaign will be held.
Value applied:	Will be determined during monitoring campaign; see also deviations from methodology
Monitoring equipment:	Tree measuring rod
QA/QC procedures to be applied:	Based on random plot verification
Calculation method:	N/A
Any comment:	Note: For *ex-ante* estimations, mean *DBH* and *H* values should be estimated for tree species *j* in stratum *i*, at time *t* using a growth model or yield table that gives the expected tree dimensions as a function of tree age.

Data Unit / Parameter:	t_2 and t_1
Data unit:	yr
Description:	Years of the monitoring activity
Source of data:	N/A
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Frequency of monitoring/ recording:
Value applied:	Will be determined based on monitoring interval
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Calculation method:	N/A
Any comment:	Used for calculation $T = t_2 - t_1$

Other Parameters that will be monitored

Data Unit / Parameter:	Internal boundary
Data unit:	Ha
Description:	Area lost
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	Loss of parcels will be monitored by monitoring the internal boundary. The internal boundary is the boundary delineating the individual polygons, or 'discrete areas of land', that together make up this instance of the project, collectively delineated as the project boundary. Measurement will be done with GPS.
Frequency of monitoring/recording:	During internal audits that aims to inspect 37.5% of the plots per year.
Value applied:	N/A
Monitoring equipment:	GPS
QA/QC procedures to be applied:	Based on random plot verification
Calculation method:	N/A
Any comment:	N/A

Data Unit / Parameter:	Stocking rate
Data unit:	%
Description:	Percentage of trees that are actually present in the line
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	Tree count
Frequency of monitoring/recording:	During inspections of the Field Technicians in the 1st 3 years every year. After that during internal audits that aims to inspect 37.5% of the plots per year.
Value applied:	N/A (to be determined)
Monitoring equipment:	none
QA/QC procedures to be applied:	Based on random plot verification
Calculation method:	N/A
Any comment:	N/A

Data Unit / Parameter:	Loss of biomass
Data unit:	tC

Description:	Amount of carbon lost through loss or destruction or fire (loss of specimen is covered by the monitoring of stocking rate (see above))
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	Visual inspection on the presence of the hedgerows
Frequency of monitoring/recording:	During inspections of the Field Technicians in the 1st 3 years every year. After that during internal audits that aims to inspect 37.5% of the plots per year and as a minimum during the monitoring campaign due before each verification audit.
Value applied:	N/A
Monitoring equipment:	None
QA/QC procedures to be applied:	Based on random plot verification
Calculation method:	N/A
Any comment:	N/A

Data Unit / Parameter:	Contractual relations between BERL and the GVH, VH and the clubs
Data unit:	Not applicable
Description:	Contractual relations between BERL and the GVH, VH and the clubs
Source of data:	Inspection by BERL staff
Description of measurement methods and procedures to be applied:	Reviewing the contract and the situation by visits and interviews.
Frequency of monitoring/recording:	Once every 5 years and in particular after 10 years
Value applied:	n/a
Monitoring equipment:	none
QA/QC procedures to be applied:	100% sample at least once every 5 years.
Calculation method:	
Any comment:	The basic assumption is that once the Jatropha trees are established, the picking of the nuts is a relative small effort yielding an interesting addition to the household income. Therefore, after some time this is intended as a sustainable additional livelihood strategy and the chances that the shrubs will be removed reduced. Hence, it is the expectation that even after the expiration of the contract, the trees will survive. In addition, the fact that the life expectancy of the average Malawian is still very low, 10 years is quite a period of time to commit to this kind of relationship.

Recorded once, not monitored

Data Unit / Parameter:	Year of planting
Data unit:	year
Description:	The year in which a polygon is planted up for the 1st time
Source of data:	Recording by BERL staff
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	N/A
Value applied:	N/A
Monitoring equipment:	none
QA/QC procedures to be applied:	Year of planting
Calculation method:	
Any comment:	

New instances must be subjected to the same monitoring regime.

4.3 Description of the Monitoring Plan

A. Purpose of monitoring

The monitoring of the BERL project has two objectives:

1. To monitor the with-project scenario. In line with the justifications in Chapter 2, the baseline and leakage do not need to be monitored; and,
2. To monitor a number of environmental and social aspects identified by the environmental impact assessment, the biodiversity baseline inventory and the socio-economic impact assessment. As a requirement of the EIA approval, BERL commits to producing a quarterly report on progress of the implementation of the Environmental Management Plan (EMP). The report will divided in to several sections referring to the EMP such as:
   - During preparation for Jatropha production
   - During production of Jatropha seeds (land preparation and cultivation of Jatropha)
   - During processing of Jatropha seeds in to bio-fuel, storage, transportation and sale of bio-fuel
   - During design and construction of storage and bio-fuel production facilities
   - Use of bio-fuel

B. Types of data and information

To fulfil the monitoring tasks, data and information will be collected and reported that will enable *ex-post* stratification of the project area on the basis of differences in growth performance across the project area. This will be measured in t C/ha/yr.

The origin of the data to be collected is a combination of periodic fieldwork for growth performance (monitoring internal project boundaries, tree establishment and loss of biomass) and internal audits.

C. Growth performance monitoring

To quantify the growth performance, BERL intends to use the allometric equation method as outlined by the CDM approved methodology AR-ACM0002 with minor deviations as outlined in Section 2.1.

The monitoring of the growth performance will be undertaken at least every 3 years until the Jatropha plantations are mature. After that the frequency will drop to once every 4 – 5 years.

All monitoring will be conducted by in-house staff of BERL, with the exception of the adherence to land selection criteria: that will also be monitored periodically by the World Food Program during their household survey.

The master database with monitoring result will be kept in the BERL main office in Lilongwe.

D. Determination of Allometric Equations

Stratification

Ultimately, the project will be implemented in all 10 districts, however currently the project has only registered clubs and plots in 6 districts: Mzimba, Kasungu, Nkhotakota, Dowa, Salima and Lilongwe. All of these Districts, apart from Lilongwe, have trees of age for the determination of the allometric equation.

Based on the preliminary silvicultural classification of Malawi in Forestry Research Record 57 of the Forestry Research Institute of Malawi (Hardcastle 1977), these areas (Districts) can be divided into 2 broad categories based on the observed growth characteristics of trees. These categories include;

Category (Stratum) 1: Lake Shore Areas that will include Nkhotakota, Salima
Category (Stratum) 2: Plain areas of Western Mzimba (Mbalachanda), Kasungu and Dowa

Each stratum will be sampled separately. The clubs in each stratum will be regarded as sampling units. In total 1,243 clubs were registered in planting seasons 2008/2009 and 2009 /2010 of which 255 are included in this PD. In total, 23% of clubs are located in Lake Shore Areas; therefore 23% of the samples will be selected from Lake Shore Areas (Stratum 1).

Sample Size & Selection

The sample size will be determined in line with the approved consolidated afforestation and reforestation baseline and monitoring methodology AR-ACM0002, which states that “the [allometric] equations [should be] ... derived using a wide range of diameters and heights, based on datasets that comprise at least 20 trees.”

The project area, as stated previously, is divided into two broad categories and will therefore be regarded as separate sampling units. To ensure that a wide range of tree dimensions are covered 1% of polyunits will be randomly selected for sampling. Using the assumption that each club has 10 polyunits; 29 polyunits from stratum 1 and 96 polyunits from stratum 2 will be sampled. In our case, each polyunit represents a farmer.

The destructive sampling that will occur in conjunction with this pilot campaign will not result in a significant loss of carbon to the project area as the sample of polyunits is minimal. In total 375 trees will be sampled, equalling 0.02% of the total number of trees planted.

Plot Size and Shape

It is recognized that the shape of the polyunits in the project area are polylines. Therefore, 25 m linear shaped plots will be used. At 100% stocking each polyline will contain 26 trees (at a 1 m spacing). Variation in the number of trees is expected and ±5 trees as a marginal error is anticipated, which is still above the minimum number of trees that is expected in each plot, which is set at 15.

For the determination of the allometric equation the stocking of the polyline will be measured. If a line has less than the stipulated 15 trees another polyline will be randomly selected for sampling.

Plot Measurements

On each plot, the following tree parameters will be measured;

- Diameter of all trees in a plot measured at 10cm distance from the base of the tree using a tree calliper.
- Height of all trees in a plot measured from the base to the tip of a tree using a calibrated tree measuring rod.

The data will be recorded in appropriate data collection forms.

Selection of Trees for Destructive Sampling
On the basis of the plot measurements, three 'normal' trees will be selected for destructive sampling. Any tree that is less than 20 cm in height will not be sampled as it is still deemed a seedling. Based on the measured diameters of all trees in a plot, the trees will be ranked. The smallest trees will be deleted from the list until the remaining total is divisible by three. The remaining trees will then be divided into three equal groups: "small", "medium" and "large". Within each size group, a tree (the middle tree in each category) will be selected for felling and uprooting. Felling of the selected trees will be done as close as possible to the ground so that all the above- and below-ground components of the tree are concisely measured.

Sampling Tree Components and their Fresh Weight Determination
The felled tree will be divided into three components – the roots, the woody component (stems + branches), and the leaves (foliage). The root system of the felled tree will be dug-out from the soil and piled together. The fresh weight of all the roots will be determined and recorded. A sample of approximately 100-200 g (including both the tap and lateral roots) will be taken to the laboratory for moisture content determination. The woody component (stems and branches) will be cut into sections and piled together. The pile will be weighed using a hanging balance. A sample of approximately 100-200 g will be taken from the woody component (a mixture of a stem and branches) for oven drying in the laboratory. The leaves will be plucked off from the branches/twigs. The total fresh weight of the leaves will be determined and recorded. A sample of approximately 100 g of the leaves will also be taken for oven-drying in the laboratory. For very small trees, the total weight of some components may be less 100 g. In such cases all the available material will be included in the moisture content sample.

Packaging the Samples
Each sample will be put in a paper bag which will be clearly labelled with the stratum number, site name, club name, plot ID, tree number, and component type. The sample will be taken to the laboratory as quickly as possible after the tree has been felled and the total fresh weight has been recorded. The bag will be closes and put immediately into a plastic bag which will be knotted tightly. A separate plastic bag will be used for each sample.

Weighing and Oven-drying the Samples
In the laboratory each sample will be weighed on an electric balance, with accuracy to at least 1 gram. Both the paper and plastic bag will be included in the weighing, but their weights will be eliminated by setting the tare of the balance (*i.e.* before starting to weigh the samples, the balance is set to zero with a dry empty paper bag and plastic bag on the pan).

Once the fresh weight is recorded, the plastic bag is removed. The samples will be dried in an oven at 105°C until a constant weight is reached. This should be attained after 24 hours but in order to verify this, several of the samples will be weighed after 24 hours and again 12 hours later to make sure that there has been no further weight reduction.

For dry weight determination, the tare of the balance is again set to allow for the weight of the bag. This time an empty bag, which has been in the oven for 24 hours, will be used, in case the bag itself loses a significant amount of moisture during drying. It will be important to weigh the samples as soon as possible after they are taken out of oven, because they quickly reabsorb moisture from the atmosphere and start to gain weight. No more than about six samples at a time will be removed from the oven.

Moisture Content Determination
Once the dry weight and fresh weight are known for the sample, the percentage moisture content (MC), ("on a fresh weight basis") will be calculated from the following equation:

$$MC = \frac{(FW_s - DW_s)}{FW_s} \times 100$$

Where FW_s and DW_s are the fresh and dry weights of the sample respectively. The moisture content will be applied to the total fresh weight of the component (measured in the field) to give total dry weight:

$$DW_T = FW_T \times (1\text{-}MC/100)$$

Where FW_T and FW_T are the total fresh and dry weights of each component of the felled trees.

Carbon Fraction
The carbon fraction is not measured but a default of 0.5 is used in all calculations.

Biomass calculations
The biomass (dry weights) of each component will be summed to provide the total biomass for the destructively sampled tree. The plot's mean biomass will be multiplied by the total number of trees in a polyunit to determine the total polyunit's biomass that will then be expressed on a per hectare basis. The standard deviations/standard errors of the values will also be determined. These are the values that will be used in the equation for estimating the optimal number of permanent sample plots (PSPs for carbon monitoring) in the project area.

The estimated root biomass will be related to the above ground (shoot) biomass to determine the root-shoot ratio (R). This will be required for the conversion of the above ground biomass to below ground biomass for the estimation of the total biomass of the whole tree.

Regression Analysis (Allometric Equations)
Based on the measured diameters and/or heights of the destructively sampled trees and their estimated biomass, an allometric equation will be developed. The power function in the form provided below will be used.

$$W = aD^b \quad \text{(allometric equation form)}$$

Where *a* and *b* are the scaling coefficient and scaling exponent respectively, and D is the basal diameter at 10 cm above ground. The power function will be used because it has long being noted that a growing plant maintains proportions between different components.

The allometric equation will be used in future to estimate the biomass of the standing trees without destructive sampling. All that will be required is to measure the tree diameters and/or heights and plug them into the equation and estimate the amount of biomass in the standing trees. This will avoid further cutting down of trees in the future, hence it will avoid a loss of carbon in the project area.

It should also be noted that the allometric equation will only be able to provide adequate and precise results within the limits of the data that was used to develop it, i.e. the limits of the tree sizes that were used. In future, when the trees become larger, a few representative trees of this larger size will be felled (approximately 20 – 30 trees) and their biomass will be calculated. This calculated biomass will be used to validate the allometric equation, to test whether the equation is able to adequately estimate the biomass of the larger trees. If the estimates are within + or – 10% of the calculated biomass, then the project shall continue using the existing allometric equation. However, if the estimates are outside this range, then the project shall upgrade the existing equation to include the larger sized trees.

E. Carbon Monitoring on Permanent Sample Plots

Stratification
Once field data has been collected for the value of the aboveground biomass and its variability, the number of permanent sample plots will be determined. As with the previous stratification, the project area is divided into two broad categories. This PD puts forward plots in Salima, Dowa and Kasungu, therefore Stratum 1 will consist of permanent sample plots from Salima and Stratum 2 will consist of permanent sample plots from Dowa and Kasungu. As this is a Grouped Project future instances will be added. Each stratum will be sampled separately, with the clubs in each stratum being regarded as separate sampling units. Within strata 1 and 2, sub-strata will be identified based on the year of planting.

Sample Size & Selection
The number of permanent sample plots will be determined in line with the A/R Methodological Tool "Calculation of the number of sample plots for measurements within A/R CDM project activities".

Random sampling will be used to select the required number of polyunits and the exact location of the 25 m linear shaped sample plot. The polylines to be sampled will be selected from the 1,745 polylines submitted with this PD. The start of the 25 m polyline will be determined using a randomly selected GPS coordinate. From the starting point, the polyline to be sampled will be the line that heads in the direction closest to North. This plot will be mapped so that the plot can be found for future monitoring purposes.

Plot Measurements
On each plot, the following tree parameters will be measured;

- Diameter of all trees in a plot measured at 10cm distance from the base of the tree using a tree calliper.
- Height of all trees in a plot measured from the base to the tip of a tree using a calibrated tree measuring rod.

It should be noted that if the allometric equations do not require the tree height parameter then this will not be measured on the carbon monitoring permanent sample plots. All data will be recorded on appropriate data collection forms.

Carbon Fraction
The carbon fraction is not measured but a default of 0.5 is used in all calculations.

Biomass Calculations
The above ground biomass of each tree will be determined using the allometric equation. The estimated root biomass will be determined using the root-shoot ratio that was calculated during the determination of the allometric equation for each DBH (or height) class. This will provide an estimation of the total biomass for the whole tree. The plot's mean biomass will be multiplied by the total number of trees in a polyunit to determine the total polyunit's biomass that will then be expressed on a per hectare basis. The standard deviations/standard errors of the values will also be determined.

F. Internal auditing

BERL has an internal audit team that is supervised by the Operational Department. The audit team ensures accurate, complete and quality data from operational areas but also draws lessons from feedback. The auditors are deployed to continuously monitor, check and verify adherence and compliance to Standard Operating Procedures of field activities (by Field Technicians (FTs), Senior Planting Technicians (SPTs) and other relevant staff) as outlined, stipulated or guided in the BERL activity calendar. This is also done to ensure timely promotion of best practices and correction of mistakes through direct corrective measures (see SOP 9.2 Introduction to Auditing v.1.1).

The audit team are provided with data that has been collected by the Field Team and processed by the Operational Control Team. During each planting season the Audit Team will visit polylines that are being planted in the current season and polylines that were planted in previous seasons. The Operational Department ensures that the audit team uses a statistically significant sampling intensity.

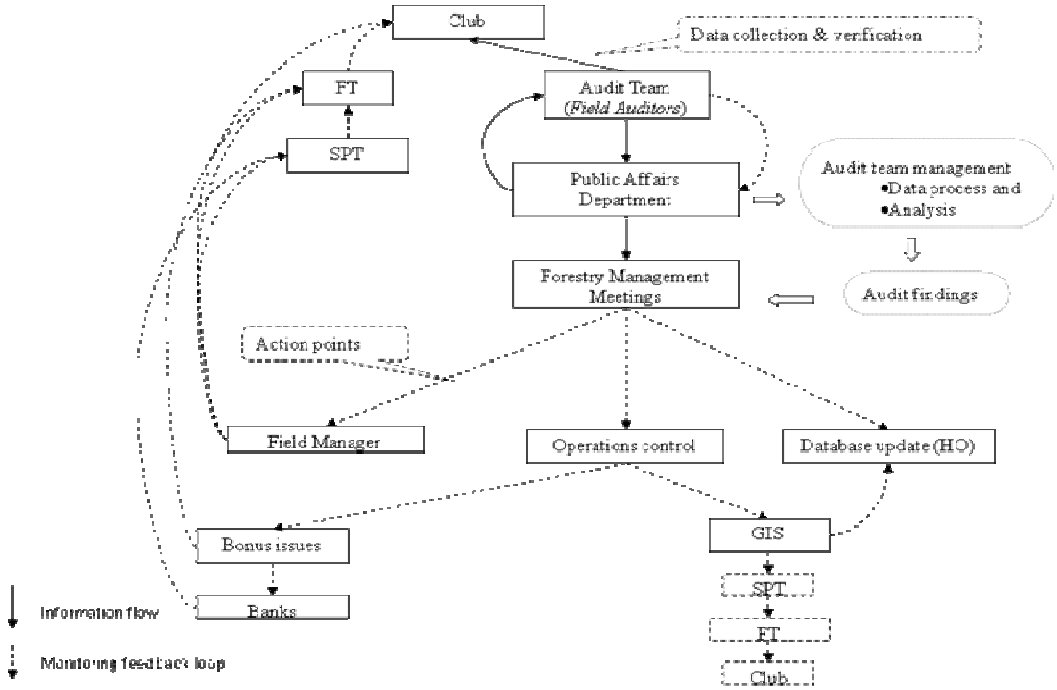
When visiting the selected plots the auditors (depending on the activity calendar) check the following criteria:

1 Club Record Keeping: The auditor will check and verify the club, the contract, the bank details, the club composition and organisation. Through this verification the auditor is checking the club's capacity to keep records in their Club Record Book (provided by BERL (See SOP 9.2.2 Club Record Keeping v.1.1)).
2 Recording of Plot Data: The auditor will check and verify the line numbers to ensure that they are the same as those from the Head Office. Being guided by the Audit Questionnaire, and through direct observations, the auditor will carry out a tree count and GPS verification exercise.

3 Monitoring Adherence to Standard Operating Procedures: Throughout the planting calendar the auditor will be tasked to check and monitor the following operational activities: land eligibility, land preparation, pitting, club registration, nursery management, transplanting, weeding, firebreak construction and pests and diseases. In addition the auditors will check deviations from the recommended measures of firebreak construction and spacing (See SOP 9.2.3 Visiting the Plots v.1.2).

Finally, the auditor will obtain and record any other feedback from the farmer which can be in the form of comments or suggestions on operational activities.

Figure 6: Monitoring and feedback loop



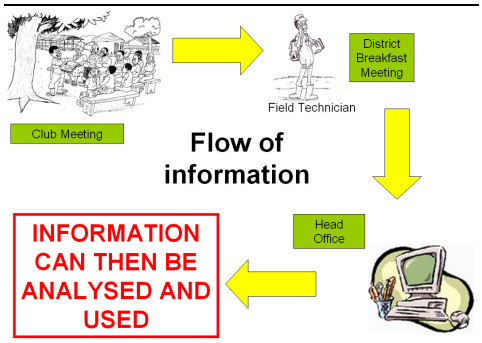
The information collected and recorded is sent to the Head Office on weekly basis through the District Office. The data is processed and analysed by the Operational Control Department and compared to the Field Technician data (see SOP 9.3 Data Analysis v.2.1). The differences are then reported back to the Management Team and appropriate actions are taken by the Field Manager / SPT accordingly (See SOP 9.4.1 Monitoring / Feedback loop v.1.1 and SOP 9.4.1.1 Corrective Measures Guide v.1.3).

G. Information & Documentation

Information Distribution

In addition to training and sensitisation meetings about operational procedures, Club Record Books are given to the farmers as well as instructions for sowing, which are written in the local language on the bags in which seeds are distributed in. Further SOPs that have been developed include, but are not limited to, land preparation, planting, tending, weeding, harvesting, pest and disease control etc. A handbook with SOPs is available at the project location.

Flow of Information and Documentation



Types of information and methods of data collection

There are many different types of information/data being collected by BERL Field Technicians including:

- Club Information
- Grower Information
- Plot Information
- GPS Information
- Delivery Information
- Bank Account Details
- Contracts

This information is collected in a variety of different formats:

- Field Technicians Record Book
- Note Book
- GPS
- Club Record Book
- Other Forms generated at Head Office with club information – for information verification

The Field Technician Record Book has 3 duplicate pages. One is kept in the book, for the FT to refer to, the second is kept at the district office, and the third is sent to Head Office. In this way, Head Office, the SPT and the FT all have the information at hand.

Activity Calendar

Documentation corresponds to specific activities in the calendar. For example:

- Club Registration
- Plot Registration
- Contract signing
- Bank Account Forming

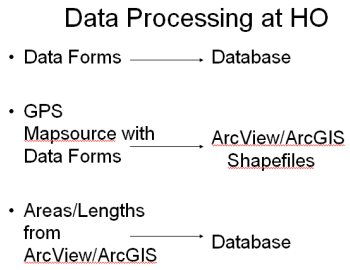
→ FT Record Book, Club Record Book

- Bonus Evaluation – Data Correction Sheet, GPS

Registration Codes

Important registration codes are used in order to manage information. For example Club ID (EPA-Club Number), Grower's ID (Club ID/Grower Number), Plot ID (Club ID/Plot Number), planting type corresponding to the year of planting (Boundaries, Lines, and Fields etc).

Bonus Evaluation and Mapping
Data Confirmation Sheets are produced with all the Club, Farmer and Plot information. During the Bonus Evaluation, the FT checks this information and maps what has been planted. The Data Confirmation Sheets are sent to Head Office and the GPS Mapsource files are emailed. Forms arriving at Head Office are checked off from the list of what is expected – this information is also fed back to the Operations Department to indicate progress.



Monitoring of Project Implementation
To ensure reliable field measurements, SOPs for each step, including all details relating to the different phases of the field measurements and provisions for documentation for verification purposes, have been developed and are adhered to. These SOPs are based on the IPCC GPG LULUCF 2003. Training courses on field data collection and data analysis are given to staff involved in the field measurements. The training courses ensure that each field team member is fully aware of the procedures and the importance of collecting accurate data. A training manual has been made which is updated frequently.

Project Boundary and Tree Establishment
BERL will use a GPS and GIS system for recording all discrete areas of land included within the project boundary. A GPS will be used to attain polygons for each parcel. These co-ordinates are then recorded along with the grower's names and club, within a central GIS database. Maps of each area will be kept according to the year in which they were incorporated into the project area.

Throughout the project lifetime the project boundary will be monitored during the internal audits. The internal monitoring regime has been set up in such a way that 37.5% of all plots are visited each year. During those visits the project boundary will be verified.

Tree establishment is recorded during the inspections that are conducted to determine bonus payments. At such time, the existence of the polylines is verified and a tree count is conducted. Lines enter the database system for carbon calculations when a stocking rate of 90% is achieved. The stocking rates are verified during visits from Lead Farmers and Senior Field Technicians (See SOP 9.5 Monitoring Plots from Past Seasons v1.1).

Loss of biomass will be recorded during the monitoring campaign that takes place before each verification audit when the sample plots are re-measured and during the internal audits.

H. *Ex-post* stratification

Ex-post stratification will be done after the first monitoring event. A stratification map using a Geographical Information System (GIS) will be created that will be used to integrate data to identify and stratify the project area. *Ex-post* stratification will be done on the basis of one key factor only: growth performance. In addition the year of planting will contribute to the variability due to variance in MAI (Mean

Annual Increment) and CAI (Cumulative Annual Increment). Upon preliminary stratification, a supplementary sampling survey and possibly further stratification will take place.

Forest management activities will be homogeneous across the project area and will not be implemented in a way that might affect growth rates. However, basing *ex-post* stratification on growth performance will ensure that any differences in management techniques from club to club will be accounted for.

Sampling framework

To determine the sample size and allocation among strata, this methodology uses the latest version of the tool for the "Calculation of the number of sample plots for measurements within A/R CDM project activities", approved by the CDM Executive Board. The targeted precision level for biomass estimation within each stratum is ± 10% of the mean at a 95% confidence level.

Given the nature of the project, the involvement of a large number of farmers, it is an institutional and organizational challenge to maintain permanent sampling plots. However, the project proponents will endeavour to have such plots with GPS identification and tracked through the GIS. Confidentiality on the location and treatment of these plots will be maintained so that they are truly examples of random selection rather than preferential treatment. Staff involved in management activities will not be aware of the location of monitoring plots. No visible local markers will be used. The plots will be treated in the same way as other lands within the project boundary and will be prevented from being deforested over the crediting period. The total sum of samples will be determined by standard and approved statistical methods.

I. Data and Parameters Monitored

The data and parameters monitored are detailed in Section 3.3 above. In summary, the following elements will be monitored to estimate the net GHG removals by sink, the overall performance of the project activity, including the integrity of the project boundary and the success of forest establishment:

- Year of Planting
- Stratification of the project area *ex post*
- Carbon stock changes in living biomass pools through permanent sample plots located by GPS (by first determining the number of plots needed in each stratum to reach the targeted precision level of ±10% of the mean at the 95% confidence level).

J. Conservative Approach and Uncertainties

The percentage uncertainty on the estimate of the growth parameter value will be assessed on the basis of the standard deviation of measured sample values using accepted statistical methods.

Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

The proposed project activity uses the CDM-approved methodology AR-ACM0002: "Afforestation or reforestation of degraded land without displacement of pre-project activities." (Version 01)

This methodology was chosen because the project meets all the applicability conditions and the methodology is, therefore, appropriate for the project. A detailed elaboration of the applicability conditions is provided in Section 2.2.

5 ENVIRONMENTAL IMPACT

An Environmental Impact Assessment was completed in February 2009. The main objective was to identify and assess the extent and magnitude of positive and negative environmental and social impacts of the project, and to identify measures to mitigate negative impacts. This EIA was obligatory to obtain a biofuel production licence from Malawi Energy Regulatory Authority (MERA).

The methodology used in the EIA is a combination of literature review, public and stakeholder consultations and field investigations. Field investigations were conducted to appreciate the current environmental and social conditions of the sites and surrounding areas and were conducted in Rumphi, Mzimba, Nkhotakota, and Mangochi.

A biodiversity survey, conducted by the Department of Forestry at Bunda College in October 2008, has been used to supplement the field investigations in these and other project impact areas.

The main outcome of the EIA

The EIA study concludes that the proposed Jatropha and bio-diesel production project manifests a positive link between environment and development. The positive environmental, social and economic benefits and impacts outweigh the negative impacts identified by the study and by the stakeholders.

Positive Impacts include:

1. Improvement of social interaction and community activity;
2. Improvement of community performance;
3. Opportunity for streamlining the role of women in Jatropha as well as other farming activities;
4. Improved value and utilization of marginal land;
5. Planting of Jatropha will help retain soils, restore soil organic content, improve soil texture and structure, and control soil erosion;
6. Protected surface and groundwater resources;
7. "Greening" of wastelands and regeneration of degraded forestlands and increased protection for animal habitant and ecosystems;
8. Soil improvement and increased agricultural productivity;
9. Employment opportunities;
10. Poverty reduction and empowerment of village communities;
11. Improved food security and standard of living; and,
12. Additional disposable income to farmers.

Negative Impacts include:

1. Soils loosened up and exposed to erosion;
2. Surface water resources silted and natural storage reduced by silt;
3. Increase in exposure to STIs and HIV and AIDS;
4. Marginalisation of women;
5. Increment in anxiety over threats to food security;
6. Disputes over land ownership;
7. Increased workload for already insufficient extension staff;
8. Risks of competition for land and local labour; and,
9. Discontinuation of the project may lead to:
    - Disturbances of local communities and rural livelihoods;
    - Disruption of local and national economies; and,
    - Risk of increase in impacts of HIV and AIDS due to loss or reduced sources of income.

More details on each of these can be found in Table 18 below.
The EIA study has revealed that the negative impacts identified are mostly of low magnitude and can be easily mitigated. An environmental management (EMP) and a general monitoring plan, and districts plans have been prepared to address and mitigate potential negative impacts.

Mitigation measures include the following undertakings:

- BERL has designed a bonus payment system which combines obligatory and technical requirements that need to be fulfilled (land selection criteria, baseline biomass, bank account, and maintenance tasks) and provides a positive incentive to continue with the maintenance of trees prior to harvest.

- BERL has established an internal audit unit, headed by a sustainability officer, who leads an internal audit system.
- BERL trains the extension staff to train the farmers. BERL selects all of their FT's through a thorough assessment process in which communication and technical skills are key. BERL offers on the job training and strives for an equitable gender balance in the recruitment of staff. Monthly meetings with extension staff and FTs help to address and solve any difficulties that have arisen (see SOP 4.1 Field Technicians v.1.1 and SOP 5.1 Training of field Technicians v.2.1).
    - Training of farmers by FT's in key issues of all the different steps in the production process of Jatropha (see SOP 7.5 Training of Farmers v.1.1)
    - Sensitisation of farmers to educate them on the benefits and challenges of growing Jatropha, for them to make an informed decision on land utilization (see SOP 6.1 Sensitisation Meetings / Awareness Campaigns v.1.1)
    - Confining Jatropha planting by using strict and clear land selection criteria, and criteria that are checked during the internal audits (SOP 6.2.1 Land Site Selection Criteria v.1.2);
    - Educating farmers to minimise land clearing, tilling and pit excavation
    - Educating farmers about collection of husks and the importance of applying compost stimulated by the seedcake that will be made available to the farmers
    - Sensitisation of farmers on HIV and AIDS and STIs and making condoms and ARVs available
- Promotion of participation of women by offering a fair purchase contract and incentive payments, combined with intensive trainings. The project aims to enable women to improve their financial position and social status.
- Collaboration with the District Assembly (including the Department of Forestry, Lands and Environmental Affairs) and the local Chief to coordinate the farmers' sensitization activities and to monitor implementation of the environmental monitoring plan.

A table with the balance of potential risks and impacts the project is likely to have on the environment, and mitigation and enhancement measures are detailed in Table 18.

Table 18: Impacts identified and mitigation measures recommended by the EIA assessors and action to be taken by BERL[13].

Project Activity	Positive Impacts (Table 5.2 and 5.3.B EIA)	Potential Negative Impacts (Table 5.2 and 5.3A EIA)	Mitigation measures for negative impacts as commented by EIA (Table 5.2 EIA)	Comments and/or measures undertaken by BERL to mitigate and/or avoid the negative impacts and enhance the positive ones

13 The EIA states that the positive and potential negative impacts have been evaluated in line with the methodology used in the EIA Sector Specific Guidelines for Malawi (1997), in terms of their magnitude and extent, significance, probability of occurrence and duration, using the scales of 1 to 5. A score of –1 or +1 denotes the least severity or least benefit while a score of -5 or +5 represents the highest severity or benefit of impact. The scores were added up to determine aggregates for each impact, as can be noted from the table below in the scores between the brackets. BERL will have to pay particular attention to the impacts with high negative aggregate scores (> -10).

STAGE 1: PREPARATION FOR JATROPHA PRODUCTION				
Establishment of Jatropha community farmer clubs	Improvement of social interaction and community activity (+15) Improvement of performance rural people (+12)	Increase in exposure to STIs and HIV and AIDS due to frequent interaction (-16) Marginalisation of women and being left out in key positions (-11)	Sensitisation of farmers on HIV and AIDS / STIs and making condoms and ARVs available Ensuring at least 30% participation of women	Encourage participation of women in farming activities and as BERL staff.
Dedication of land to planting of Jatropha		Anxiety over threats to food security (-12) Disputes over land (-7) Marginalization of women and disadvantaged groups over land ownership. (-11)	Sensitize and assist community or individuals to make the right choice on land to be used for planting Jatropha. Ensure no growing contracts are formalised for disputed land. Establish channels and mechanisms for land dispute resolution. Encourage and assist women to own land and to participate in Jatropha planting.	Organisation of sensitisation meetings. Contracts are not with communities with land tenure conflicts
STAGE 2: PRODUCTION OF JATROPHA SEEDS (LAND PREPARATION AND PLANTING)				
Land preparation and digging of planting pits		Soils loosened up and exposed to erosion (-13) Surface water resources silted and natural storage reduced by silt (-11)	Education of farmers to minimise land clearing, tilling and pit excavation	Instructions are clear and have been emphasized and taken up in the trainings to Field Technicians and farmers
Long term cultivation of Jatropha plantation	Improved quality of marginal land through soil holding capacity of Jatropha root systems and foliage turning into manure (score n.a.) Improved value and utilization of available land (+11) Improved vegetative cover	Threats to food security as more and more land is planted to Jatropha (-12)	Avoid using arable land Enforcement of land suitability criteria during application to plant Jatropha by farmers and during evaluation visits for bonus payments	Use of stringent land selection criteria and internal audits with sanctioning measures (i.e. Not continue with farmers who did not follow rules) Is enforced before contract and during evaluation visits for bonus payments

	and soil binding (+14) Improved animal habitat and ecosystems as vegetation and SOC is restored (+18) Protected surface and groundwater resources (+13)			
Increase in agricultural extension services	Improved land, soils, water properties and ecosystems (+10) Increased farm output and income (+12)	Increased workload for already insufficient extension staff (-6)	Training extension staff	Training extension staff to cope with increased workload Continue the collaboration with NGOs and government extension staff for optimum outreach and efficiency
STAGE 6: PROJECT PHASE OUT				
		Discontinuation of the project may lead to: Disturbances of local communities and rural livelihoods (-12) Disruption of local and national economies (-13) Risk of increase in impacts of HIV and AIDS due to loss or reduced sources of income. (-13)	Prepare and empower farmers to continue with the planting of Jatropha for sell to other organisations or to export	BERL collaboration with the Bio fuel Association is helpful

In addition to the EIA, BERL also commissioned a **Biodiversity Baseline Survey**. The biodiversity baseline survey, conducted by the Department of Forestry of Bunda College at the end of 2008, was conducted on sample plots in the districts where the project plans to operate. At that time the exact locations where BERL would plant were not all known, so the work was conducted in the general operating areas. The indicators of biodiversity included vegetation type and structure, richness of vascular plant species, soil texture, abundance of insect species and presence and signs of existence of animals.

The baseline biodiversity survey (2008) concluded that:

- There are no major endangered species on the sites earmarked for cultivation of Jatropha and the proposed investment is not seen as a threat to biodiversity resources;
- Jatropha has been grown at a small, non-commercial scale in Malawi for the past 30 years and that where it is grown, it is not self propagating and therefore, it is not expected to be invasive;
- Most of the land earmarked for Jatropha is covered by common grass species, which would not be considered as endangered species and are frequently lost to bush fires.
- The most serious threat to biodiversity in the sites is common occurrence of bush fires and over-

exploitation of woody resources for fuel wood. This is not attributed to the planting of Jatropha, however, there is need for conservation measures such as controlled early burning, conservation awareness activities and local-level decrees not to cut some of the important shrubs surrounding Jatropha plantations.

- There were no vegetation plots surveyed with canopy heights greater than 5 m and most sites are open grassland and shrubland and this confirms the notion that planting of Jatropha will not result in deforestation and displacement of substantial volumes of indigenous species.
- Most of the sites surveyed at that time (>60%) were classified as having degraded and marginal land under grasslands covered by common species such as *Themeda triandra, Hyperrhenia rufa and Hyperrhenia dissolute* while >40% was composed of shrub land and derelict abandoned land. This suggests that growing Jatropha would not have significant negative effects on the biodiversity resources. However, very few sites have threatened species and trees and shrubs of economic importance So little so that out of over 300 plots assessed only four plots revealed existence of four threatened species (A*fzelia quanzensis, Pterocarpus angolensis, Dalbergia melanoxylon* and *Terminalia sericea)* suggesting only a meagre 1.33% of the plots contain threatened species. To this effect mitigation measures should be established where Senior Planting Technicians of BERL are able to take note of these threatened species and conservation areas and will stay away from them. The land selection criteria chosen ensure that these areas are spared for conservation of threatened species.
- Establishment of mixed-species tree plantations (Jatropha and threatened species) in degraded lands will have net positive environmental effects such as sequestering atmospheric carbon, restoring critical ecosystem services such as watershed functions and connecting isolated forest fragments in order to allow for species migration in response to unfavourable abiotic factors such as high temperatures.
- The biodiversity baseline survey was conducted during the dry season of the year when most of the land had lost most grass vegetation and some herbaceous plants due to fires that burn most savannah vegetation. In light of this the team recommends conducting as similar study during the wet season (February to July) when there is more vegetation growth.

New instances may not have more severe environmental impacts as identified in and authorised by the first EIA.

6 STAKEHOLDER COMMENTS

Operating at the landscape scale across Malawi, the proposed project activity involves a large number of stakeholders at different levels within both the public and private sector. These include:

- Small Scale Growers and Farmers Clubs
- Commercial Growers
- National Smallholders Farmers' Association of Malawi (NASFAM)
- Ministries: Ministry of Agriculture and Food Security, Department of Energy, Malawi Energy Regulatory Authority, Lands Department and Ministry of Trade and Industry
- Regional bodies: Agricultural Development Divisions (ADDs), District Agricultural Development Offices, District Executive Committee (DEC)
- Private sector

In the early stages of project conception the relevant Ministries and the World Food Program were contacted and involved in initial project design. Once the initial design was laid out, the project proponents utilized the following mechanisms for encouraging stakeholder participation and subsequent assessment of input. The project design has been flexible at each stage to allow for adaptive management based on stakeholder feedback:

1. A stakeholder workshop in November 2008
2. Stakeholder consultations were conducted as part of the Environmental Impact Assessment, (Jan- July 2009),
3. A Socio Economic Impact Analysis was conducted (March-August 2009).
4. A stakeholder workshop in December 2009

Stakeholder Workshop: Shaping the Biofuel Industry in Malawi
BERL recognizes the important role other individuals and organizations play in the biofuel value chain and therefore organized a one day workshop in November 2008 to discuss ways and means to shape the biofuel value chain and industry in Malawi.

Relevant stakeholders were invited and participated, including: governmental bodies, civil society organisations, commercial growers, private companies and the small holders association NASFAM, amongst others. Themes discussed relating to the use of land for Jatropha were:

- The importance of land for food production, and therefore the need for stringent land selection criteria for Jatropha to grow on unproductive land
- The positive impact that the Jatropha project might have on poverty reduction through the diversification of farmer income, fair prices and incentive payments, social village project and provision of employment.

The workshop concluded that all stakeholders and government welcome the promotion and production of biofuel in Malawi. The following issues were raised as needing to be addressed, both by BERL but also within the broader context of market development within Malawi:

- The need to develop standards for biofuel production that will minimise the impact on biodiversity
- The need to develop clear tax, pricing and levy policies on biofuel
- The need to develop a strong governance framework on biofuel production in Malawi in line with existing policy frameworks
- The need for research and development support in order to take care of the varied demands and requirements from the private and public sector

In order to achieve all these issues raised during the workshop, there is need for effective stakeholder participation throughout the design and implementation of the proposed project activity.

Environmental Impact Assessment
Interviews with individuals and representatives of stakeholder institutions were conducted during the stakeholder consultation process, using a structured questionnaire, focus group discussions and community meetings. These stakeholders included officials at the National Level (Ministry of Agriculture and Food Security, Department of Energy, Malawi Energy Regulatory Authority, Lands Department and Ministry of Trade and Industry). Consultation was extended to staff of different Agricultural Development Divisions (ADDs), District Agricultural Development Offices, District Executive Committees (DEC),farmers from Extension Planning Areas (EPA's) and farmers in selected BERL impact districts (to include Mzuzu, Mzimba, Nkhotakota and Mangochi); Also consulted were people from the National Herbarium and Botanic Gardens and from oil companies such as BP and Total, and the staff of BERL.

The consultations provided a forum for highlighting concerns and opportunities to arise from the proposed project activity. The consultations also assisted in gathering relevant and up-to-date environmental and socio-economic information about the project areas.

The people consulted suggested ways to avoid or minimize adverse impacts and to enhance potential benefits. These suggestions and potential negative aspects were taken into consideration during the design of the proposed project activity.

Socio Economic Baseline study
BERL requested the World Food Programme, who annually already undertakes a household survey in Malawi in collaboration with NGO's, to commission a specific baseline study for the proposed project activity. The study has taken place from March to August 2009, and was executed by Wadonda Consult (WACO, 2009). The methods that have been used are household and community questionnaires, discussions with focus groups and interviews with farmers.

The baseline survey has established both the likely positive and negative effects of Jatropha cultivation among smallholder farmers that are largely engaged in subsistence farming for their food security. The findings are summarized below:

There is a strong interest of farmers to participate in the cultivation of Jatropha, and they are optimistic about the positive benefits of Jatropha. Jatropha cultivation is seen as an opportunity to generate cash without diverting food crop production land to the cultivation of an additional food crop. The most cited benefits are generating more cash income for the household, commercialisation of farming products, access to extension services, and promotion of savings through linkages to financial institutions and poverty reduction. Nonetheless, the farmers feel uneasy about the certainty of the market and the price of Jatropha.

Concerns were raised about endangering food security. The study recommends that significant farmer sensitization is implemented. There needs to be strict monitoring on land eligibility to prevent the temptation of cash income to lead farmers to make unsustainable choices. Such monitoring requires additional labour resources or a community-based solution to monitor the proper use of land in the Jatropha cultivating areas or rules within the groups that bind the members to best practices. For example, those that are growing Jatropha as a boundary hedge, are likely to be tempted to use productive land once the economic returns of Jatropha that they have experienced are attractive. This is a special group that requires monitoring at the beginning of each growing season.

Three main issues have been identified that relate to the management of the implementation process. These are issues relating to the bonus system, access to financial services and access to extension services. The following recommendations were made:

Bonus System
The survey concluded that there is mixed understanding of how the bonus system is expected to operate and the pre-conditions. The focus group discussions revealed wide misunderstandings about the bonus system, the timing of the bonuses and the expected institutional arrangement that the farmer groups have to fulfil in order to get their bonuses. Under the project concept, smallholder farmer groups are expected to open bank accounts to which the bonuses are expected to be paid. At the time of the study many farmer groups (clubs) were yet to open such bank accounts. These issues should be emphasized by project personnel during extension visits to farmer groups.

Access to Financial Services: Opening Bank Accounts
The issue of bonuses is linked to limited access to financial services and the transaction costs of opening bank accounts in urban and peri-urban areas away from farming communities. This suggests the need for the project to link farmers to formal or micro finance institutions that have mobile services. Since, a cash crop is being promoted there is some optimism that some of the financial institutions may be willing to provide such services.

Improvement of Extension Services
The positive income effects will depend on assuring the farmers a reliable market and commercial viability of the produce. In order to enhance the positive income effects, there is need for improved access to extension services to smallholder farmers on the management of Jatropha for farmers to realise maximum gains from Jatropha cultivation. One strategy that has worked well in farmer based organisations is to identify key farmers in each area that can be technically oriented in the management of Jatropha to be providing technical advice to fellow farmers. This may require some investment in transport facilities such as purchasing bicycles for such farmers.

The comments received during these consultative processes were taken into account by BERL as follows:

Establishment of Communication Processes

- Formation of Biofuel Advisory Council (government and private sector involvement). This council holds regular meetings for stakeholders to express their views. Minutes of all meetings are taken and are available in the public domain;
- Formation of a Biofuel Association, which is an initiative for all Jatropha growers in Malawi. The Association is currently writing a position paper on the impact areas. The position paper contains the idea of adopting a code of conduct/quality/sustainability standard to ensure that Jatropha will not be planted on food crop areas and that it will not lead to the cutting of existing trees, - as a negative public image will affect the whole biofuel sector in Malawi;
- Sending out a newsletter (every 3 months) updating stakeholders on progress of the project activities;
- Taking R&D steps in partnership with research institutes.

Mitigation Measures

In order to sustainably promote the production of biofuel, BERL has put in place mechanisms that will make sure that the growing of bio-energy crops will not compete with labour, land and food security, BERL will;

- Follow very strict land selection criteria to ensure that Jatropha does not take up arable land for food crops
- Map all areas where Jatropha is being grown under its contract farming system
- Increase training of the FTs
- Improve the farmer extension system: the FTs are selected on their capability of communicating clearly with the farmers/farmers clubs about the principles of the project and how to put these into practice
- Manage a comprehensive internal audit system

Monitoring

- Continual mechanisms of feedback and improvement through the Advisory Council and the Biofuel Association
- Ongoing socio-economic monitoring by adding a number of appropriate parameters to the household survey that the WFP conducts periodically

Table 19 below presents the results from various consultations in 2008 and 2009 and the response of the project to them.

Table 19: Results From and Response To Stakeholder Consultation

Organisation	Topic	Outcome
Ministry of Lands and Natural Resources	Ministry is responsible for 1 million ha of forest. Officially those areas are managed by the Ministry but many cases of deforestation occur. Especially in the South, land availability is an issue.	BERL is applying strict land eligibility criteria that avoid planting on good agricultural land and the removal of indigenous trees.
Ministry of Lands and Natural Resources	DEA focal point for environmental and climate change issues. Also DNA for the CDM. Jatropha can target both areas for alternative energy and reforestation. Introduction to BERL. This project is the first private initiative for carbon credits in Malawi. The project is supported.	No action was required

UN World Food Program	Discussed overlapping areas for TNT and UN WFP. Responsible transport and biofuels. Jatropha as cash crop and for poverty alleviation.	WFP included numerous questions related to land use in their household survey and will monitor socio-economic impacts of the project over time.
Ministry of Lands and Natural Resources	Update on activities investor. Preliminary discussions on capacity building for certification.	BERL has started quite a number of studies with national institutes such as Buda college to stimulate the transfer of knowledge and technologies.
UN World Food Program	Increase yield maize with use of seed cake?	BERL is returning 50% of the seed cake to the farmers to stimulate soil fertility.
UNDP	Introduction to BERL. How does the farmer profit? Is there a degree of ownership? Look at standards from WWF. Focus has been on diversification farming. Food security can not be compromised.	BERL is applying strict land eligibility criteria that avoid planting up good agricultural land and removal of indigenous trees.
Ministry of Energy and Mines	Introduction of BERL. Discussed taxes and levies on fuels, export restrictions. Also imported volumes and current pricing and blending of ethanol.	The prices that BERL will pay for the nuts and the fuel price that they'll ask is coordinated with Ministry. The price at the pump will need to be the same as for regular combustibles.
Department of Forestry	Introduction of BERL to new officer in charge. Discussion regarding land availability. Comments were made that hillsides can become an issue since nobody owns this land.	BERL is applying strict land eligibility criteria and land ownership is one of them.
BP	Introduction to BERL. BP is looking into feedstock for biofuel to export to Europe. Petroleum Imported Limited tenders and checks quality.	A biofuel round table was initiated that includes all relevant stakeholders in the production chain of biofuels and the government
Total	Introduction of BERL. Total is looking to invest in alternative energy. Discussed value chain and transport of fuel to Malawi to get insight in logistics and stakeholders.	A biofuel round table was initiated that includes all relevant stakeholders in the production chain of biofuels and the government
Energem	Introduction to BERL. Discussed Malawi Bureau of Standards specifications for fuel/diesel. Position Energem on the market.	A biofuel round table was initiated that includes all relevant stakeholders in the production chain of biofuels and the government
Petroleum Control Commission	Introduction of BERL. Who are stakeholders of PCC? Policies for biofuels in Malawi? Guidelines for licensing. Storage costs in Beira and Ncala.	A biofuel round table was initiated that includes all relevant stakeholders in the production chain of biofuels and the government
Ministry of Transport, Public Works & Housing	Introduction of BERL. Dept of Transport will be involved in testing of biofuels. Car ages in Malawi? First test in government fleet.	A biofuel round table was initiated that includes all relevant stakeholders in the production chain of biofuels and the government
UNDP	Capacity building activities under the CDM. UNEP is focal point of East	BERL will certify carbon credits under the VCS. Decision made to involve

	Africa. What are BERL plans in the future?	BERL when capacity building is starting on CDM since BERL has experience in this field.
National Smallholder Farmers Association of Malawi	Smallholder farmers most of then have less then 1 HA available. Jatropha to be introduced as cash crop.	Growers get incentive payments to bridge the time of planting and a 1st yield. Jatropha is presented to the farmers as additional income and not as a replacement income for food crops.
Department of Environmental Affairs	What is needed in terms of environmental issues for BERL? Who are the stakeholders involved with carbon finance projects?	EIA is needed for whole value chain and site for processing.
Ministry of Energy and Mines	Update on TNT investment in BERL. There is a new body for license application, Malawi Energy Regulatory Authority.	Ongoing consultation
Department of Environmental Affairs / Department of Forestry	Introduction of BERL and sustainable Jatropha production. Discussed sustainable livelihoods forestry programs. How can BERL fit in to these programs? Carbon trading in forestry. BERL should join forces for capacity building.	See above
World Bank	What are the agronomics of Jatropha? Productivity on marginal lands?	BERL is applying strict land eligibility criteria that avoid planting up good agricultural land.
Department of Environmental Affairs	Briefing on all sectors involved in climate change. Contacts for data on environmental reports for every district.	No action was required.
Ministry of Energy and Mines	Discussed the Kinshasa SADC meeting on biofuel policies. Most important issues are 2nd generation biofuel crops and land policy.	Continued collaboration via Sustainable Biofuel Roundtable
Department of Forestry	Information on charcoal market, survey for forest stewardship. Land use district maps. Peace parks Foundation, carbon finance. Consultants names for EIA	No action was required.
NASFAM	NASFAM could be subcontracted for club building/training and community capacity building. What is the formal market for farmers? NASFAM could target tobacco farmers. BERL will come up with proposal for NASFAM to engage their smallholder farmer groups.	BERL to identify areas for pilots for NASFAM farmers in Mangochi.
Agricultural Research and Extension Trust	How we can cooperate with the tobacco smallholder farmers linked with ARET? BERL could work through the extension network of ARET.	BERL to identify areas of cooperation including research

UN World Food Program	Preliminary discussions on SEIA	Led to major questionnaire that was completed by households providing insight to BERL in farmer income and labour etc.
Ministry of Lands and Natural Resources	Discussed EIA criteria and WFP social economic impact assessment.	BERL is applying strict land eligibility criteria that avoids planting up good agricultural land.
National Smallholder Farmers Association of Malawi	Discussion on MoU, training field staff, crop protection, benefits to farmers, end products of Jatropha oil	MOU with the Association
Coopi Maleza	Discussing partnership in Kasungu district with Malawian NGO	MOU to be drafted with COOPI
Malawi Energy Regulatory Authority	Explanation of price build up for diesel. Role of Malawi Bureau of Standards	Included in Sust. Biofuel Round table.
Malawi Bureau of Standards	Discussions on role of MBS in biofuel industry	Included in Sust. Biofuel Round table.
Ministry of Agriculture and Food Security	Invitation for Ministry to give presentation at stakeholder workshop on November 24. To present topics of importance for Agriculture and Food security.	Stakeholder workshop was organised.
Injena Petroleum	Initial discussion on biofuels	Included in Sust. Biofuel Round table.
Ministry of Energy and Mines	Introduction of BERL. Discussed stakeholder workshop.	Stakeholder workshop was organised.
Ministry of Energy and Mines	Update after initial stakeholder workshop on November 24, 2008. Discussing start of Biofuel Advisory Council	Ongoing consultation
Ministry of Finance	Price setting and membership for Biofuel Advisory Council.	Ongoing consultation
Malawi Energy Regulatory Authority	Protection of feedstock by proof of provenance feedstock in licensing	Ongoing consultation
Ministry of Agriculture and Food Security	Implementing extension through farmers' schools. Focus on value chain and long term twinning with universities	Ongoing consultation
Ministry of Energy and Mines	Discussing 1st meeting of Biofuel Advisory Council	Ongoing consultation

New instances must form part of the ongoing stakeholder consultation process.

ANNEX 1: CLUB CONTRACT

BERL®
Bio Energy Resources Ltd.

This agreement is made this.....day of.....Two Thousand and.....between **BIO ENERGY RESOURCES LIMITED** of P.O. Box 1075 LILONGWE in the Republic of MALAWI (hereinafter referred to as 'BERL'), a company duly registered and incorporated in the said REPUBLIC OF MALAWI And (insert club name) ..... **BIO ENERGY RESOURCES LIMITED GROWERS CLUB,** CLUB ID Number: ..... Of ..... village, Group village headman ..... Traditional Authority ..... Of ..... District, in the said Republic of Malawi (hereinafter called "the CLUBS"), of the other part

WHEREAS BERL being interested in promoting the growing of Jatropha curcas trees hereby agrees with THE CLUB that the club be engaged in the business of plantation management and cultivation of the trees and collection of their seeds.

AND WHEREAS BERL being desirous of obtaining a steady and long term supply of Jatropha curcas seeds, the parties together hereby enter into an exclusive Jatropha curcas seed supply and plantation management agreement.

1. AGREEMENT TO CULTIVATE JATROPHA CURCAS AND PLANTATION MANAGEMENT

'THE CLUB' THIS DAY HEREBY agrees with BERL as follows:

a) TO plant and grow Jatropha curcas trees for the benefit of club members and BERL.

b) TO diligently attend all training and field days conducted by BERL and/or its agents aimed at ensuring that the quality of the plantation and the field meets BERL's standards at all times

c) TO keep, maintain and retain proper records showing clearly the club's details in the form required by Berl

d) TO ALLOW BERL, its agents or employees at all reasonable times to have access to and to inspect the club's records and other documents relating to the subject matter of this agreement and take copies or extracts from them and on demand to supply copies to BERL

e) TO ensure that the technical expertise and guidance provided by BERL and/or its agents is fully and properly utilised and adhered to.

f) TO sell all Jatropha seeds planted and cultivated in terms of this agreement only to BERL and no other person whether natural or juristic for a period of ten (10) years from the date of commencement of this agreement.

g) TO properly clean and de husk the seeds before offering them for sale to BERL.

h) TO arrange for and bear the cost of all transport logistics and delivery of the seeds at the premises of BERL or other delivery point agreed.

i) TO collectively work as a club and to effectively resolve all disputes at club level

'BERL' THIS DAY HEREBY agrees with THE CLUB as follows:

(I) TO provide seed for the growing of the trees

(II) TO provide sacks for packing seed into 40 kg bags

(III) TO provide training in land selection, preparation, seed sowing, and plantation management

(IV) TO buy properly cleaned and de husked seeds per tonne at a minimum price of us$150; the price shall be quoted in UNITED STATES OF AMERICA DOLLARS (US$), but payable in Malawi Kwacha (MK) at the prevailing exchange rate at the time being, on the day of the transaction which shall be reviewed as necessitated by the said international markets by BERL.

(V) TO COMPLY with any laws, regulations and requirements.

PROVIDED ALWAYS and it is hereby agreed as follows:-
The duration of the agreement shall be for 10 (ten) years from.....day of .....two thousand and..... (20.....) which shall be renewable for at least two (2) successive ten (10) year periods.

THAT; THE CLUB understands that their plantations line will form part of a verified emission reduction and sequestration project.

THAT; THE CLUB agrees to transfer the legal title to all existing and future emissions rights generated by the club in relationship to the growing of Jatropha exclusively and only to BERL.

THAT; THE CLUB will co-operate with BERL in the verification of the emission reductions.

TERMINATION OF THE AGREEMENT
This agreement may be terminated by either party by giving the other party six (6) months notice period.

GENERAL CLAUSE
The land is held under Land Registry Title Number..... ... In the name of.....and location.....E.....S As privately owned / leased / customary/communal land (delete those that do not apply)

APPLICABLE LAW AND ARBITRATION
The legal relations between the parties under or in connection with the Agreement shall be governed by the Laws of Malawi and disputes arising out of or in connection with this Agreement shall be determined by the courts of Malawi.

VARIATION/ AMENDMENT CLAUSE
The parties hereby agree that the terms of this agreement may be varied and/or amended as can be reasonably expected from time to time.
No party may unreasonably refuse to agree to the variation and/or amendment of the agreement

IN WITNESS WHEREOF the duly authorised representatives of the parties have here unto signed:

For and on behalf of **BIO ENERGY RESOURCES LIMITED (BERL)**

SIGNATURE..... DATE.....

NAME..... DESIGNATION.....

WITNESSS..... DATE.....

NAME..... DESIGNATION.....

For and on behalf of..... BERL GROWERS CLUB

SIGNATURE..... DATE.....

NAME..... DESIGNATION.....

WITNESSS..... DATE.....

NAME..... DESIGNATION.....

Approved by Group Village Headman:.....Date.....

ANNEX 2: LAND ELIGIBILITY

Checking Land Eligibility and Registering Plots

PART A. Checking the Eligibility of the plot
Before registering the plot, the land should be checked to make sure it is ELIGIBLE to plant Jatropha.
In order to be eligible, the Land:

- **SHOULD NOT** have been forest in the last 10 years (check the uploaded map on the GPS)
- **SHOULD NOT** be prone to waterlogging (or else the Jatropha will not survive)
- **SHOULD NOT** be Unallocated Communal Land (or else the Jatropha may be removed in the future)

Once this has been checked, and the land meets the above criteria, the plot can be registered in the FT Record Book.

If the plot has had forest in the last 10 years, is prone to waterlogging OR is on unallocated communal land DO NOT REGISTER THE PLOT. IT SHOULD NOT BE PLANTED WITH JATROPHA.

PART B. Registering the plot
On the 'Mpanda Planting Registration' page of the FT Record Book:

1. Fill in the Grower's name and ID in column 2 and 3.
2. Ask the farmer - Do you clear and burn the crop residue on the land before planting?
   - Yes – Circle Y in column 4;
   - No – Circle N in column 4;
3. Ask the farmer – To improve the productivity of your land do you need to use fertiliser or manure?
   - Yes – Circle Y in column 5;
   - No – Circle N in column 5;
4. Land ownership: Is the land:
   - Allocated communal land – Circle A in column 6;
   - Privately owned land – Circle P in column 6;
   - Estate land – Circle E in column 6;
5. Record the GPS single waypoint of the plot in column 7;
6. Use the GPS to estimate the length of the Mpanda and fill in the number of metres in column 8.

ANNEX 3: CLUB REGISTRATION FORM

Club Details - Head Office Copy				Date……..
Club Name:		Club I.D:		
Field Technician:		Tree target:		
Village Name:		Group Village Head:		
T.A.:		New or existing club:		
EPA:		District:		
GPS:				
No.	Grower's Name	Sex	Phone Number	Remark
1	Chairperson:			
2	Secretary:			
3	Treasurer:			
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
Number of seedlings required to gap up last year's plots (only for existing clubs):……				
Attendance Register				
Number of Men Attending……				
Number of Women Attending……				
	Signature of FT ……	Signature of club member……		
	Lead Farmer in Cluster:……			

ANNEX 4: DISTRICT INFORMATION

This annex briefly describes the topography, soils, climate, forests, vegetation and environment, and the economic setting in the districts where the proposed project activity will take place: Rumphi, Mzimba, Kasungu, Nkhotakota, Dowa, Salima, Lilongwe, Ntcheu / Dedza, Machinga and Mangochi (EIA, 2009, and DSOERs, 2004).

Please note that both the Biodiversity Baseline Survey and the Environmental Impact Assessment were done before the exact locations of the - generally small sized - polygons were known and that not all districts have been visited. At the locations that were visited, the biodiversity survey encountered mainly grassland and shrubland, with the land conditions being medium to very degraded: over 60% of the sites planned for planting with Jatropha were found to be degraded and marginal land under grasslands covered by common species such as *Themeda triandra*, *Hyperrhenia rufa* and *Hyperrhenia dissolute* while over 40% was composed of derelict abandoned shrubland. This suggests that growing of Jatropha curcas would not have significant negative effects on the biodiversity resources. However very few sites have trees and shrubs of economic importance and threatened species such that out of over 300 plots assessed only four plots (1.33%) revealed existence of four threatened species (*Afzelia quanzensis, Pterocarpus angolensis, Dalbergia melanoxylon and Terminalia sericea*). To this effect mitigation measures should be established where Senior Planting Technicians for BERL have to take note of these conservation areas and will stay away from them. The land selection criteria chosen ensure that these areas are spared for conservation of threatened species (Biodiversity Survey, 2008).

RUMPHI District:

Topography, soils, vegetation and environment

Rumphi District is predominantly hilly with scattered valleys and a wide variety of soils that includes: latosols, calcimorphic soils, hydromorphic soils, lithosols and regosols. Alluvials are the dominant soils, which are very deep, well drained, brown, red and of medium texture.

Vegetation varies according to the relief. There is montane grassland, Brachystegia woodland and the Nkhamanga plain where human activities and settlement have modified the vegetation, is dotted with mixed thicket.

There is considerable deforestation within the district, especially outside the borders of the Nyika National Park where many people do not have alternative sources of energy to wood. Potential sites in Rumphi include Chamwazil, Ubagha, Kaputa (two plots) and Joe. The smallholder farmers in Mzimba have large tracts of land that they spare for the production of Jatropha. In general the farmers have opted to grow Jatropha in sandy soils which otherwise require a lot of inputs for the growing of arable crops.

Economy

The main economic activities of the district are agriculture and commerce. However, the challenges of farming are the scarcity of agricultural inputs and water, partly due to the poor road network. The majority of the people run out of food in the months of November to February. During this time, the people resort to selling livestock, firewood and traditional beer. Commerce is mainly restricted to Rumphi Boma and Bolero Rural Growth Centre. The main agricultural crops include tobacco, maize and groundnuts.

MZIMBA district:

Topography and Soils

The major physical features in the district are the Viphya highlands, a high plateau with large pine plantations and natural forests; plains in the west; hillzones with moderate to steep slopes and valleys along the rivers in Kabuwa. The soils have moderate to good drainage. Fertile loamy soils are found in the valleys and are suitable for agricultural production. The total forest reserve area is 233,926 ha, covering 54% of the total forest area of Mzimba. The forests are indigenous and

woodland forests. Plantation forests, grasslands with forest remnants, dry grasslands with fallow or regenerating shrubs and seasonal grasslands are common in some parts of the district.
The environmental problems include deforestation, soil erosion, water resources degradation and depletion, human habitat degradation and threat to biodiversity.
Potential sites in Mzimba include Amoni, Chibela, Chimdima, Chihototo, Chikwache, Lindenim Chinjoka, Mzuku, Tchingeni, Thunduwike and Kaphiriwitha in Mpheremphe and Malidade EPAs. The smallholder farmers in Mzimba (like those in Rumphi) have large tracts of land which they spare for the production of Jatropha. In general the farmers have opted to grow Jatropha in sandy soils which otherwise require a lot of inputs for the growing of arable crops.

Economy
Agriculture is the main economic activity of Mzimba District, which has 575,350 ha of arable land. About a third of the arable land under cultivation is used by smallholder farmers while the rest is under estates. Among the major crops grown in Mzimba are maize, millet, burley tobacco, oriental tobacco, ground nuts, beans paprika, and soya while minor crops are Irish potatoes, cassava, coffee, fruits, vegetables, pigeon peas, and flue cured tobacco.

KASUNGU District
Topography, soils, vegetation and environment
The district has predominantly gentle slopes. Prominent landforms include the Kasungu National Park, the Mchezi and Chimaliro forest. A wide variety of rocks and sediments are found. The district is dominated by ferralic and chronic cumbisols that are well drained, course to medium texture and reddish in colour. Sandy clay loam and pure sandy soils are very dominant in the North West, while reddish soils are dominant in East.
Kasungu used to be thickly covered under savannah woodland in some areas interspersed with montane grassland. However due to human activities such as settlement, agriculture and high demand for wood as well as wood products, the land has gradually lost almost 70% of its forest cover. Currently forests can only be found in the protected areas. Environmental degradation is evidenced by heavy deforestation, which has left many areas bare. High levels of soil erosion result in siltation of rivers and loss of soil fertility.
Commercial Jatropha sites in the Santhe EPA of Kasungu are Kandaule Estate belonging to General Farming Company Limited and Chasale and Chitipi that belong to individual farmers. The main vegetation type on commercial farms earmarked for Jatropha cultivation is grassland dominated by *Hyperrhenia* species, *Chloris gayana*, *Trichodesma physaloides* with small patches of natural woodlands that are reserved. Most of the areas were under intensive cultivation and woody plants have been uprooted for tobacco farming. The land was used for agricultural cultivation but due to persistent low yields (even after intensification) the owners decide to plant Jatropha as a commercial crop. Most of the areas are degraded mainly due to continuous cultivation.
The smallholder farmers' sites (customary sites) include Lupafya, Mkazimasika, Aleza, Kabwiramungu, Mphangwe, Champhanda and Chinkwangwa. The main vegetation type is scrubland (68.2 %). The local farmers have so far abandoned the sites because of poor maize yields and shrubs are regenerating at a very slow rate. Hence full recovery may take long. Trees are scattered and the farmers want to put these sites to Jatropha cultivation.

Economy
Agriculture is the main economic activity of the district. Kasungu District has a total of 139,558 farm families, with an average land holding size of about 1.9 ha. Smallholder farm covers 50% of the total arable land. About 51% of farm families own less than 1.0 ha of land. The local farmers have abandoned large areas of land because of poor maize yields and shrubs are regenerating at a very slow rate. Hence full recovery may take long.

NKHOTAKHOTA District
Topography, soils, vegetation and environment

Nkhotakota District elevation ranges from 493 metres to 1,683 metres. The soil in the district is of the low altitude ferruginous variety. From the sub-soil to a depth of 60cm, the soil is red clay or sandy clay loam and of low permeability. The red clay loam is suitable for the cultivation of cotton, maize, tobacco, groundnuts, sweet potatoes, paprika, soya beans, and pigeon peas while sandy clay loam soil is appropriate for growing sugar cane, cassava, beans, and rice.
Two forest reserves occupy approximately 36,660 ha of land. The total protected or reserved area covers 220,000 ha or 52% of the district's total land area. The major forests consist mainly of *Brachystegia* woodlands. This type of woodland is dry-deciduous and semi-deciduous. The forests under customary land system have been heavily affected by human activities such as opening of gardens, fuel wood, timber and charcoal making. This has caused the variation of forest resource from place to place. There is high rate of environmental degradation in Nkhotakota district as a whole. Soil erosion ranges from 0 – 15 metric tonnes per hectare per year and is conspicuous in hilly areas. There is an increase in deforestation due to cultivation and cutting down of trees for firewood and timber. Uncontrolled bush fires contribute greatly to biodiversity loss and soil erosion. These practices as well as reported incidences of poaching contribute to loss of large wild animals leaving birds, insects, and reptiles as commonly seen animals in the rest of the district except the forests and game reserves.

Economy
Agriculture is the main economic activity in Nkhotakota District. The main crops grown are maize, cassava, rice, cotton, tobacco (burley) and sugarcane. Smallholder farmers grow almost all the crops, including sugar cane. Cassava and maize are the main food crops while tobacco, rice, sugar cane, and cotton are cash crops. Groundnuts, beans, soya, chillies, millets, cow peas, paprika and sweet potatoes are also grown as minor crops. Livestock types currently available in the district include: cattle, goats, sheep, pigs, rabbits, chicken, ducks, and guinea fowls.

DOWA District
Topography, soils, vegetation and environment
Half of Dowa district is predominantly hilly. The Western part is low land and suitable for agriculture and is fairly drained by Kasangadzi River. The Eastern part is well drained by rivers with less arable land for cultivation. The most predominant soils are the sticky laterite in the hilly east lands where erosion is noticeable and mixed sand and clay on the Western plain where erosion is negligible.
The environment in Dowa district has been degraded due to deforestation from agricultural expansion, bush fires for fuel wood and brick curing.
The sites visited by the biodiversity survey in Dowa are Kapasula in Mndolera EPA, Namzalamba, Nyanje, M'mwaye, Mpanda Hill and Chefu and the results reveals that generally in Dowa district 68% of the vegetation is predominantly grassland with less shrub land having a few isolated trees. The trees and shrubs recorded at the sites include; *Lannea discolour Cussonia orborea, Jubernadia paniculata, Percopsis angolensis, Lanchocarpus cappasa, Strychnos spinosa, Combretum molle and Brynchystegia* speciforms.

Economy
The economic activities in Dowa district include agriculture, fishery, mining, tourism and trading.
The agriculture sector has both food crops (maize, cassava, sweet potatoes, groundnuts, beans, soya beans and leafy vegetables) and cash crops (tobacco, fruits and paprika). Livestock kept in the area include cattle, goats, pigs, sheep rabbits and poultry.

SALIMA District
Topography, soils, vegetation and environment
Salima district is located on the lakeshore plain along Lake Malawi. The underlying rock creates complex outcrops in the rift escarpment approximately 5km of Salima Township. Unconsolidated alluvial and colluvial deposits dominate the geology of Salima. Salima District's vegetation pattern is complex, largely due to human induced disturbance due to cultivation for agriculture. The major vegetation is savannah woodlands, mixed woodlands, wetlands, sparsely vegetated or un-vegetated

sand dunes, and cultivated land. Forest cover in forest reserves is being reduced at steadily alarming rate by over dependence on fuel wood and opening up of new cultivation areas due to population increase. The environment is heavily degraded as noticed by the declining number of forest products (charcoal, bamboo and firewood)

Economy
Economic activities include agriculture, mining, fishing, and smallscale businesses. Agriculture is the major economic activity with main crops being maize, rice, sweet potatoes, burley tobacco, groundnuts and cassava. Agricultural products and fish dominate markets.

LILONGWE District

Topography, soils, vegetation and environment

The Lilongwe plain is characterised by flat surfaces and it lies at an altitude of 1100-1200m above sea level. Lilongwe District has a warm tropical climate with Mean Annual Temperatures of about 20 degrees to 22.5 degrees Celsius. The lowest temperatures are experienced in July, ranging between 7.5 to 12.5 degrees Celsius. In November, the temperatures rise to about 39 degrees Celsius and the highest temperatures occurs in October. There are three distinct seasons (cool, dry and rainy seasons) in Lilongwe District. The cool season is from May to July; the dry season from August to October and the rainy season is usually from November to mid April.

The Lilongwe plain experiences an annual rainfall of 800 to 1,000mm. Rainfall distribution is highly influenced by orographic effects in that the windward sides of hills and mountains receive more than the leeward sides and areas with high elevation receive more rainfall than low lying areas.

The rock types include gneisses, granulites, schist including important developments of pegmatite rocks. All these rocks are assigned to the Malawi Basement Complex. Soils around the project area are generally sandy loamy with an integration of rock aggregates. The original underlying deposits are alluvial and colluvial and are characterized by ferruginous properties. The soils are good for cultivation but are however, susceptible to erosion because of the large proportion of sand and rock aggregates.

The environment for Lilongwe District has been seriously degraded due to deforestation attributed to agricultural expansion, structural development, fuel wood harvesting and brick curing. Siltation and disposal of waste are also serious environmental problems.

Economy

Agriculture is one of the main economic activities in the Lilongwe area, providing income and livelihood for the local people. The main crops grown are maize, beans, sweet potatoes, and vegetables. Livestock is generally low in the e area with chickens as the main domestic animal. Other economic activities include vending, second hand clothes selling, and hawking.

NTCHEU District

Topography, soils, vegetation and environment

There are two distinct terrain patterns in Ntcheu district: the Bwanje Valley with alluvial soils and the Kirk Range with an upland area. The soils vary with altitude. The plateaus have either ferruginous soils with lithosols or ferallitic soils, the escarpments, have either sandy soils with lithosols or stony, ferruginous soils. In general, the soils have varying fertility levels with Bwanje Valley being the only area good for agricultural production.

Ntcheu district has four forest reserves, occupying 138 square kilometres. The forests contain indigenous and bamboo trees. Major threats to the forest reserves are illegal cultivation, bushfires and illegal cutting down of trees for firewood and charcoal. Ntcheu District Assembly has engaged community participation in forestry management in order to foster local ownership and to promote sustainable utilization of trees.

Economy

The main economic activity in Ntcheu district is agriculture. Smallholder farmers constitute the majority of the farming community with an average land holding size of 0.8 ha. Maize occupies a huge chunk of the total area planted for staple food. Fruits are predominantly produced in Bwanje RDP while vegetables are grown in Ntcheu RDP. Bananas and tomatoes are also produced in high quantities. The agriculture sector is the major employment provider employing approximately 90% of the population.

DEDZA District

Topography, soils, vegetation and environment

The district has three distinct topographical zones; the Lilongwe Plain, the Dedza Highlands and the Dedza Escarpment, with rolling to steeply dissected topography.

The soils in Dedza are moderately deep and well drained, brown to reddish brown in colour and course to fine textured.

Dedza district has a wide variety of both indigenous and exotic trees, which are evergreen and deciduous. There are 8 forest reserves in the district covering a total of 97,148 ha. Key environmental problems in the district are: soil erosion (due to agricultural expansion land sizes have become smaller and agriculture on steep slopes is increasing), deforestation, water resources degradation and depletion, human habitat degradation, threat to fish resources and threat to biodiversity.

Economy

Agriculture is the main economic activity in Dedza district providing income and employment for a large population. The main crops grown are maize (both local and hybrid), tobacco, beans, soya beans, groundnuts, Irish potatoes, sweet potatoes, cassava, cowpeas, finger millet and vegetables. Livestock is generally low in the district with chickens and goats as the main types. Other economic activities are related to natural resources, and these include forestry, fisheries, bee keeping, and tourism. Commerce and industry is dominated by small to medium enterprises.

MANGOCHI District

Topography, soils, vegetation and environment

Mangochi lies in the rift valley plain, and is undulating to hilly. The most predominant soils are the lithosols. These soils are generally shallow and stony occurring mainly in the rift valley escarpment.

Mangochi District has five major forest reserves covering 141,228 ha representing 2.5% of the district's total land area. The forest reserves are predominantly *Brachystegia* woodland, with sparse cover of grass within the woodlands.

The sites visited for the biodiversity survey in Mangochi are all in Lungwena EPA and included Liguluche, Malunda, Ntamba and Ntakataka. All the sites except Ntakataka had over 50% vegetation covered by grass.

The environment for Mangochi district has in general been seriously degraded due to deforestation from agricultural expansion, tobacco curing, fuel wood and brick curing; siltation, and disposal of waste.

Economy

The economic activities in Mangochi district include agriculture, forestry, tourism, commerce and industry.

The agriculture sector has both food crops (maize, rice, sweet potatoes, cassava, groundnuts, beans, pigeon peas, cow peas, soya beans, fruits and vegetables) and cash crops (tobacco, cotton and groundnuts).

MACHINGA District

Topography, soils, vegetation and environment

The district is divided into five major topographical areas, the Shire River, the Great Rift Valley, mountainous hilly zones and the Kawinga plain. A wide variety of rocks and sediments are found. The district is dominated by ferralic and chronic cumbisols that are well drained. Sandy clay loam and pure loam soils are very dominant in Machinga District making it suitable for agricultural production.

The major vegetation types are semi evergreen forest in the reserves, there are some community owned reserves; perennial wet grasslands around the lakes, while open canopy woodlands and shrubs are mostly located in upland area and in Kawinga forest. A total of 92,265 ha is under forest cover. Most people in the district depend on forest resources such as trees for fuel wood, timber and poles. Therefore, environmental degradation is noticed by heavy deforestation, which has left many forest areas bare leading to high levels of soil erosion.

Economy

Agriculture is the main economic activity of the district. Main crops grown in Machinga include maize, rice, sorghum, cowpeas, cassava and tobacco and minor crops are chillies, cotton, beans millet and sesame. Livestock currently available in the area include; cattle, sheep, goats, pigs, rabbits and poultry. Other economic activities are fishing, mining and bee keeping.

ANNEX 5: DESCRIPTION OF RELEVANT LAWS

This annex contains a description of relevant laws, acts and policies (EIA, 2009). See 1.10 for an assessment of the project's compliance with the legal and policy framework.

POLICY FRAMEWORK

The Constitution of the Republic of Malawi, 1995

The Constitution of Malawi provides a foundation for environmental management in Malawi. Section 13 (d) defines the role of the State in environmental management as follows:

(a) To manage the environment responsibly in order to:

- Prevent degradation of the environment
- Provide healthy living and working environment for the people of Malawi
- Accord full recognition to the rights of future generations by means of environmental protection and sustainable development of natural resources
- Conserve and enhance the biodiversity of Malawi

(b) To enhance the quality of life in rural communities and to recognize rural standards of living as a key indicator in the success of Government policies.

National Environmental Action Plan, 1994

The National Environmental Action Plan (NEAP) developed in 1994 and updated in 2004 provides a framework for integrating the environment into all socio-economic development activities of the country. The objectives of the NEAP are to: document and analyse all major environmental problems and measures to alleviate them; promote sustainable use of natural resources in Malawi; and develop an environmental protection and management plan. The NEAP identifies the following as key environmental issues to be addressed: soil erosion, deforestation, water resources degradation and depletion, threat to fish resources, threat to biodiversity, human habitat degradation, high population growth, air pollution and climatic change. Most of the issues identified are linked to agriculture and therefore, any efforts to address the issues will involve and benefit the agriculture sector.

In order to protect the environment from further degradation; the NEAP outlines actions that need to be undertaken to ensure adequate environmental protection. The actions relevant to the Jatropha and production include: Promotion of agro-forestry; Construction permanent physical conservation structures such as storm water drains, terraces and bunds; Improvement of land productivity through sustainable land saving technologies; Intensifying training of farmers in improved farming practices; and Improvement of management of forest resources on customary land

National Environmental Policy, 2004

Malawi's National Environmental Policy is aimed at promotion of sustainable social and economic development through sound management of the environment and natural resources. The policy seeks, among other things, to:

- Secure for all persons now and in the future an environment suitable for their health and well being
- Promote efficient utilization and management of the country's natural resources and encourage, where appropriate long- term self-sufficiency in food, fuel wood and other energy requirements
- Facilitate the restoration, maintenance and enhancement of the ecosystems and ecological processes essential for the functioning of the biosphere and prudent use of renewable resources
- Integrate sustainable environment and natural resources management into the decentralized governance systems and ensure that the institutional framework for the management of the environment and natural resources supports environmental governance in local government authorities
- Enhance public education and awareness of various environmental issues and public participation in addressing them
- Promote local community, NGO and private sector participation in environment and natural resource management

National Forestry Policy, 1996

Among other issues, this policy advocates prevention of changes in land-use, which promote deforestation, constrain farm forestry or endanger the protection of forests with cultural or biodiversity or water catchment conservation values.
The Policy further recognizes environmental impact assessment as an important tool for new projects as one way of promoting sustainable management of forest resources.

National Land Policy, 2002
The National Land Policy focuses on land as a basic resource common to all people of Malawi. It provides the institutional framework for democratizing the management of land and outlines the procedures for protecting land tenure rights, land-based investments and management of development at all levels. It ultimately seeks to promote optimum utilization of Malawi's land resources for development.
The policy recognizes agriculture development as the major benefactor land use sector and highlights a number of approaches for addressing problems facing land resources. Among other issues, the policy: guarantees full legal protection of the customary land tenure to the people of Malawi, to enable the ordinary Malawians to adequately participate in agricultural activities and other rural livelihoods; recognizes several sectoral policies and strategies in physical planning, fisheries, environment, forestry, irrigation and wildlife and for this reason it encourages a multi-sectoral approach in land use and management at local and district level; recognises social actions that influence and control people's use of land and realises that the rights of women, children and the disabled are usually denied on the basis of customs and traditions or disregarded due to prejudice and lack of effective presentation. In view of this and of the increasing land pressure due to population growth, the policy calls for clear consideration of gender and the rights of children and the disabled (including those affected by the HIV and AIDS pandemic) in planning and implementation strategies of land based investments. It requires that an environmental impact assessment be undertaken for all big land development projects, and those planned in fragile ecosystems in order to protect biodiversity and water resources recognise the damaging effects of poor agricultural methods and land use practices. Chief among these is high smallholder population concentrations, primitive agriculture technologies and soil erosion

Contract Farming Strategy, 2007
The strategy seeks to achieve economic growth and development in the agriculture sector. Firstly, the strategy seeks to cushion farmers' weaknesses in the production, processing and marketing of various agricultural commodities. Secondly, this strategy aims at enhancing forward and backward market linkages as advocated in the country's referral policy framework, the Malawi Growth and Development Strategy (MGDS). Lastly the strategy provides the need for the interested parties to transfer new technologies to the farmers and hence enable them access lucrative markets with minimal risks.

National Land Resources Management Policy and Strategy, 2000
The policy was developed under the International Scheme for the Conservation and Rehabilitation of African Lands (ISCRAL) to which Malawi is a signatory. It is consistent with the recommendations made in the National Environmental Action Plan (NEAP), 1994.
The policy addresses issues such as land capability, land degradation, land suitability, land tenure, land conservation, soil erosion, water course systems and sustainable land use. Its overall goal is to promote the efficient, diversified and sustainable use of land based resources both for agriculture and other uses in order to avoid sectoral land use conflicts and ensure sustainable socio-economic development.

Crop Production Policy, 1987
The Crop production Policy aims at improving a balanced and diversified production of food and cash crops to meet the country's requirements for food, foreign exchange and raising rural incomes. It further aims at improving and maintaining the productive potential of the land.

Malawi Growth and Development Strategy, 2006 - 2011
The Malawi Growth and Development Strategy (MDGS) is the overarching operational medium-term strategy for Malawi designed to attain the nation's vision 2020. The MDGS builds on the Malawi Economic and Growth Strategy (MEGS) that emphasises the need to create a conducive environment for private sector investment to stimulate economic growth. It also incorporates lessons from the implementation of the Malawi Poverty and Reduction Strategy (MPRS). The main aim of the MDGS is to

create wealth through sustainable economic growth and infrastructure development as a means of achieving poverty reduction.
The MDGS has identified six priority areas of agriculture and food security; irrigation and water development; transport infrastructure development; energy generation and supply; integrated rural development; and prevention and management of nutrition disorders and highlights the main development strategies identified for the key priority areas and thematic focus areas.

LEGAL FRAMEWORK

Environment Management Act, 1996
The Environment Management Act provides the legal basis for the protection and management of the environment and the conservation and sustainable utilization of the natural resources.
The Act, under Section 24 specifies the types and sizes of activities in Malawi that require an Environmental Impact Assessment (EIA) before they can be implemented. A prescribed list of projects to which (EIA) applies is provided in the EIA Guidelines of 1997.
The Act outlines the EIA process to be followed in Malawi; and requires that all project developers in both the public and private sectors comply with the process. The Act under section 26 (3) further requires that no licensing authority issues any license for a project for which an EIA is required unless the Director of Environmental Affairs (DEA) has given consent to proceed; on the basis of a satisfactory EIA or non-requirement of an EIA. Non-compliance with the EIA requirements is an offence and attracts penalties.

Forestry Act, 1997
The Forestry Act provides for participatory forestry, forest management, forestry research, forestry education, forest industries, protection and rehabilitation of environmentally fragile areas. The act among other things seeks to: augment, protect and manage trees and forests on customary land in order to meet basic fuel wood and forest produce needs of local communities and for the conservation of soil and water; promote community involvement in the conservation of trees and forests in forest reserves and protected forest areas; prevent resources degradation and to increase socio-economic benefits; promote community involvement in conservation of trees and forests; promote optimal land use practices through agro forestry in small holders farming systems; protect fragile areas such as steep slopes, river banks, water catchment and to conserve and enhance biodiversity.

The Act under Section 28 highlights an environmental impact assessment as an important tool for making an informed decision for granting permission for developments in protected forest reserves. This provision is consistent with the provisions of Guidelines for Environmental Impact Assessment.

Land Act, 1965
The Land Act (Cap 57.01) mainly deals with land tenure and land use. It recognises that every person, including the vulnerable (women, children and the disabled) has a natural dependence on land; and that it is therefore important for the government to provide for secure and equitable access to land (as a resource and an economic asset) by clearly defining security of tenure.

ANNEX 6: LIST OF FARMER CLUBS

Unique Clubs	Club Name	Village	GVH	No. of Plots	No. of Farmers
197-100	Chirimbilitso	Kamphonje 4	Kamphonje 1	11	11
197-101	Mzeru Zawo	Sangwa	Sangwa	10	10
197-14	Tasauka	Mtayamakoko	Yonamu	6	6
197-18	Umodzi	Mwantisi	Yonamu	7	7
197-21	Nkhalango	Mkhukhi	Mkhukhi	1	1
197-35	Tikondane	Mususu	Kapunzira	4	4
197-36	Tipindule	Kabwabwa	Kapunjira	4	4
197-41	Tikondane	S 1	Guwende	6	5
197-48	Titukule	Kaphuka	Guwende	3	3
197-54	Mseza	Kagona	Kagona	9	8
197-60	Mukachitabwino	Kambandule	Mkhukhi	6	6
197-62	Sendeleya	Chankhwa	Mkhukhi	2	2
197-66	Chilima	Mkhukhi	Mkhukhi	12	12
197-67	Namachete	Chiunjiza	Chiunjiza	10	10
197-68	Kachele	Chiunjiza	Chiunjiza	10	9
197-69	Chitsime	Chiunjiza	Chiunjiza	8	8
197-87	Chipanga	Chitsulo	Chitsulo	2	2
197-88	Chisomo	Chitsulo	Chitsulo	6	6
197-91	Chivulu	Mwazawala	Chitsulo	11	11
204-10	Chiwalo	Zilasi	Gamba	3	3
204-14	Kaphiri	Kaphiri	Kabwazi	2	2
204-15	Fatima	Chimsuku	Kabwaza	2	2
204-2	Talora	Ntawa	Lukasi	4	4
204-26	Chinsensa	Gonondo	Mziikamo	6	5
204-3	Mvunguti	Mtawa	Kabwazi	9	9
204-33	Mapalo	Katope	Kabwazi	7	5
204-38	Chankhokwe	Nandeta	Kamphikure	6	6
204-4	Tidziwane	Kambanga	Kabwazi	9	7
204-42	Kabumba	Chaima	Kaphatika	6	6
204-43	Kabvula	Kabenu	Kabenu	3	3
204-46	Tiyanjane	Masiya	Kasiya	5	5
204-49	Madalitso	Kachulu	Kabwazi	9	8
204-50	Kadyanthungo	Mankhambira	Nsauko	7	7
204-52	Naphiri	Mnthambara	Kapangama	11	10
204-61	Ufulu	Kamachenjeza	Kasiya	1	1
204-64	Tisasiyane	Feleji	Kabenu	4	4
204-65	Umodzi	Mkweche	Mkweche	12	10
204-9	Mwayiwathu	Kachere	Kabwazi	13	11
206-10	Kasumba	Kasumba	Kasumba	12	11
206-118	Manera	Jason	Chikulumeni	10	10
206-12	Kawaye	Kawaye	Kawaye	7	6
206-18	Mayankho	Mnyamula	Mnyamula	11	9
206-35	Katunundu	Katunundu	M'nyamula	12	11
206-37	Makanda	Makanda	Makanda	4	4
206-46	Mtondo	Msokwa	Kantchembere	5	5
206-48	Sakiza	Sakiza	Sakiza	3	2
206-53	Mwaiwanu	Nyanja	Nyanja	7	6
206-54	Kathewera	Kathewera	Nyanja	7	7
206-56	Chikwangwala	Kaphiri	Chilowa Matambe	6	6
206-58	Zilinde	Zilinde	Simwaza	6	4
206-68	Angoni	Kapokola	Mingu	7	7

206-71	Tithandizane	Mwachande	Chagweluka	2	2
206-74	Tipondepo	Mamba	Mamba	4	4
206-77	Kadyankhadze	Kadyankhadze	Mamba	7	6
207-101	Eden	Chikanda	Chikanda	10	10
207-30	Takondwa	Ngombengo	Kwambankhuku	3	2
207-39	Misuku	Mkhalakuti	Mkhalakui	7	7
207-40	Chimungu	Mkoloweka	Nkoloweka	1	1
207-41	Tiyanjane	Kammbanga	Kammbanga	11	11
207-46	Chikwanje 2	Goma	Goma	2	2
207-47	Mkhalapaminga	Mkhalapaminga	Mkhalapaminga	2	2
207-48	Kangawa	Kangawa	Chidambofisi	9	9
207-56	Chitokoto	Kaomba	Kaomba	5	5
207-57	Kontho 2	Makalani	Damalekani	12	12
207-80	Nzeruzatha	Mau Apawo	Mau Apawo	8	8
207-81	Mgwirizano	Chikanda	Chikanda	6	5
208-16	Vilimunthazi	Kamkowa	Kamukowa	8	8
208-20	Temwanani	Temwanani	Masumbi	3	3
208-21	Tionerepo	Chakwakwa	Chakwakwa	6	6
208-22	Yolamu	Yolamu	Mbatata	5	5
208-33	Mwaiwathu	Kadewere	Zanda	6	5
208-34	Chikondi	Ng'ombeyavuka	Ng'ombeyavuka	4	4
208-35	Chimwemwe	Chindeu	Mphomwa	6	6
208-37	Chifundo	Matutu	Zanda	11	11
208-42	Ziyewe	Ziyewe	Ziyewe	3	3
208-44	Mandevu	Mchema	Chavunguma	12	12
208-8	Kajikhomere	Kajikhomere	Kajikhomere	10	9
50-27	Munyehere	Munyehere	Mbuzi	4	4
50-37	Chilimbikitso	Jala	Jala	12	10
50-52	Zabeta	Zabeta	Mzungunika	5	5
50-55	Mzungunika	Mzungunika	Mzungunika	3	3
50-56	Kachenyula	Kachenyula	Mzungunika	6	6
50-59	Simiyoni	Simiyoni	Chironeka	4	4
50-60	Tiyanjane	Joseph	Chitoneka	3	3
50-64	Kachisuzi	Kachisuzi	Mzungunika	5	5
50-65	Katondo	Thamuleme	Mzungunika	4	4
50-68	Khwengwe	Khwengwe	Mzungunika	2	2
50-72	Wanangwa	Vyawa	Aramu	8	8
50-77	Nthumbira	Nthumbira	Aramu	11	8
50-79	Chipulikano	Mateyo	Aramu	4	3
50-80	Kamkowa	Kamkowa	Aramu	3	3
50-83	Mwayi	Chinkhoswe	Aramu	5	5
50-87	Kachere	Chiphyelero	Aramu	5	4
50-89	Tiwonelepo	Chingala	Chingala	10	8
50-91	Mchenga	Esake	Aramu	2	2
50-92	Fyoti	Fyoti	Chingala	14	14
50-93	Layina	Chingala Piyo	Chingala	14	12
50-94	Tiyezge	Store Zabron	Aramu	3	3
59-12	Mkonkhomwala	Kholongo	Chimkolo	15	14
59-13	Mndumba	Kawaye	Kawaye	6	5
59-2	Tionelepo	Chimungu	Chimungu	9	9
59-35	Galaundi	Mbiya	Chimkolo	2	2
59-36	Tigwirizane	Malikete	Chikomangala	7	7

59-37	Mpondo	Mtenje	Kawaye	6	6
59-38	Phingo	Buluwayo	Katambo 1	13	13
59-41	Mango	Kafumbata	Kawaye	5	5
59-44	Mwangudana	Palamuleni	Kawayeq	7	7
59-48	Kanthonga	Chinzili	Chimbuli	2	2
59-49	Mayiwathu	Kumadzi	Chikomangala	6	6
59-50	Mpuntha	Chikomangala	Chikomangala	5	5
59-51	Tiyesenawo	Kamgundu	Chikomangala	8	7
59-52	Tavana	Katambo	Chikomangala	6	6
59-53	Chawawa	Sungeni	Sungeni	10	9
59-61	Chimphonongo	Mwambimbi Pitala	Chilumpha	7	7
59-63	Maziko	Phava	Maloya	4	4
59-67	Talandila	Musa	Chimungu	11	11
59-69	Kanyenda	Kanyenda	Chimungu	13	13
59-71	Genesesi	Genesesi	Mayola	11	11
59-74	Mvunguti	Kanyenda	Chimungu	10	10
59-78	Katondo	Mphanda	Wiki	7	7
60-10	Khoche 1	Nambamba	Nambamba	10	9
60-13	Kachingwe	Litepo	Litepo	8	8
60-15	Kamphinda	Kamphinda	Tsankanga	8	8
60-16	Naombwa	Naombwa	Chankunda	6	6
60-2	Mchenga 1	Changunda	Changunda	7	7
60-20	Madalitso	Cheza	Thosi	6	6
60-26	Litepo	Litepo	Litepo	10	8
60-28	Khoche 2	Nambamba	Nambamba	3	3
60-31	Msangu	Milika	Chitwale	4	4
60-32	Msangu	Milika	Chitwala	5	5
60-33	Chakwawa	Chakwawa	Mkwanda	4	4
60-35	Kagwamtipenya	Chakwawa	Mkwanda	8	8
60-36	Chikondi	Chithyola 1	Jonas	3	3
60-46	Nkhawa	Nkhawa	Nambamba	7	7
60-5	Msikidzi	Kachiza	Sangaambe	3	3
60-6	Kachere	Tsankanga	Tsankanga	3	3
61-10	Kachere	Chipodzi	Chipodzi Buwa	10	10
61-30	Thedze	Njobu	Chipozibuwa	11	9
61-42	Mtendere	Katakwe	Katakwe	4	4
61-47	Kazepa	Kalimila	Njonjo	7	6
61-48	Tilimbike	Imani	Chipozinkhono	1	1
61-55	Leya	Siliya	Siliya	7	7
61-91	Kawira	Nambamba	Kanzinkambani	1	1
61-92	Chimsewo	Kandodo	Kanzinkambani	9	9
64-32	Tithandizane	Tsokomole	Kasuntha	7	7
64-42	Chigwira	Ndelemani	Mkwera	4	4
64-46	Chinthawale	Thumbati	Kasuntha	8	8
64-50	Kang'ona	Nkhuyu	Nkhuyu	7	7
64-51	Umodzi	Dambo	Nkhuyu	7	7
64-53	Mayeselo	Dambo	Nkhuyu	8	8
64-54	Mtanga 1	Mkamile Simion	Mbingwa	3	3
64-74	Chalinda	Chalinda	Mafuthe	6	6
65-14	Kaferapanjira	Kafera	Dzoole	6	6
65-15	Kagwatipenya	Kapindi	Dzoole	4	4
65-26	Mlombwa 2	Mlombwa	Nyengere	10	10

65-27	Mlombwa 1	Mlombwa	Nyengere	9	9
65-34	Nkhweza	Kawande	Malamula	15	12
65-38	Tangupenya	Msiyambiri	Chipyoza	5	4
65-42	Tiyamike	Chasimpha 2	Chasimpha	3	3
65-53	Nkuwantha	Nkuwantha	Sendeza	14	12
65-58	Mkunkhumwala	Bvumo Kazoma	Bvumo Kazoma	10	9
65-61	Chitaya	Totomoyo	Mthunzi	18	13
65-62	Taonana	Poloto	Poloto	8	8
65-63	Msomba	Bvumokazoma	Bvumokazoma	8	8
65-64	Tiyanjane	Chifuti	Poloto	13	11
65-68	Katondo	Kachulukampata	Kachulukampata	13	12
65-70	Osaukasatopa	Pilingu	Bvumokalinde	16	14
65-71	Mtawa	Chibweza	Mthunzi	14	13
65-72	Mtunthama	Mgoli	Bvumo Kalinde	7	7
65-73	Mwaye	Kanthungo	Kachisa	14	12
65-82	Nkhalango	Kayaza	Kayaza	3	3
65-83	Thanthwe	Kayaza	Kayaza	9	8
65-84	Chikondi	Mulande 3	Mulande	5	5
65-85	Tiyesele	Kafansiyanji	Mulande	4	4
65-87	Msitu	Kangulu	Kangulu	10	10
65-88	Tiyeselepo	Tembo	Kuphela	9	8
65-89	Kabuluzi 2	Kabuluzi	Kabuluzi	3	3
66-17	Mkhangala	Kamphampha	Chimpeni	7	7
66-40	Thotho 1	Thotho	Chinyanya	11	9
66-47	Sanga	Mtema	Pomphe	1	1
66-48	Mtema	Mtema	Pomphe	9	8
66-58	Nthyoka	Nthyoka	Chinyanya	6	6
66-59	Chinyanya	Chinyanya	Chinyanya	6	6
66-63	Ngolomi	Ngolomi	Chinyanya	9	9
66-79	Lodzeni	Lodzeni	Pomphe	11	9
87-109	Talandira	Brash 2	Chimombo	8	8
87-112	Tilimenji	Chisidze	Mbalame	10	9
87-113	Tilimbike	Brash 1	Chimombo	10	9
87-68	Tapezayathu	Binali	Ngolowindo	9	8
87-79	Ngolowindo	Ngolowindo	Ngolowindo	3	3
87-87	Tipindule	Mazombwe	Kampindo	3	3
88-112	Tigwirizane	Kambwiri	Kambwiri	2	2
88-125	Tongole	Makoloje	Mtika	11	11
88-64	Mkombe	Ngolomi 1	Ngolomi 1	11	11
88-71	Chiyanjano	Mnjeza	Ngolomi 1	6	6
88-73	Tidziwane	Malota	Malota	2	2
88-75	Tayambani	Choma	Ngolomi	2	2
88-76	Alinawo	Katumba	Katumba	8	6
88-80	Tilimbike	Ndiuzayani	Reuben	1	1
88-83	Tidziwane	Mnesi	Chana	5	5
88-84	Alinafe	Mchilowero	Ngolomi 2	8	7
996-12	Mnong'onanji	Lusitala	Chimphanga	2	2
996-19	Liwazi	Chikasima	Chinkwapulo	11	11
996-29	Tsokalawo	Sosola	Sosola	5	5
996-31	Tsikadzakokha	Sosola	Sosola	7	7
996-34	Kasakula	Kasakula	Chilenga	13	13
997-16	Chimonjo	Chimonjo	Chimonjo	4	4

997-21	Mwalawoyera	Nkhwangwa	Nkhwangwa	6	6
997-32	Mtengo Wa Mango	Kapanda	Kapanda	1	1
997-33	Timvane	Mtanda	Mtanda	7	7
997-39	Mnkolonsa	Solomoni	Chikaonga	7	7
997-41	Mandimu	Kachigulu	Kapanda	8	8
997-50	Mkuyu	Matchakaza	Chidzaye	5	5
997-57	Jenda 1	Chomba	Mpanje	5	5
997-58	Mtowo	Katukusha	Chimojo	5	5
997-60	Tikondane	Mtenje	Mtenje	7	7
998-100	Njeka	Njeka	Njeka	14	14
998-101	Msatiyese	Ziso	Chonkhwa	5	5
998-102	Msambakusi	Msambakusi	Kamjuwa	8	8
998-104	Nowa	Nowa	Tchezo	14	14
998-106	Mkuyu	Mpeni	Chipezayani	8	8
998-107	Chikukula	Chikukula	Nkhulande	13	13
998-109	Mazaleni	Mazaleni	Kawongo	8	8
998-110	Tiripo	Wilima	Yesaya	8	8
998-111	Masunkha	Buku	Yesaya	13	12
998-115	Tiwone	Chasweka	Belekia	4	4
998-117	Mtima Umodzi	Jamison	Chinula	8	8
998-123	Kasheshe	Nkweu	Zakalia	9	9
998-124	Chitsanzo	Maseleka	Timeo	8	8
998-125	Papaya	Timeo	Timeo	14	13
998-128	Kanyata	Timeo	Timeo	12	11
998-133	Madalitso	Mkweu	Zakalia	9	9
998-148	Katuta	Kamphilulira	Kamphilulira	2	2
998-149	Gowokani	Pelekamoyo	Pelekamoyo	2	2
998-150	Chisangalalo	Gamaliyele	Gamaliyele	5	5
998-163	Ndaya	Ndaya	Simulemba	4	4
998-165	Julias	Hannock	Julias	2	2
998-167	Gwedegwede	Majikusamba	Majikusamba	1	1
998-52	Kadafa	Kadafa	Kadafa	9	7
998-55	Takumana	Takumana	Kadafa	3	3
998-62	Museza	Jeremani	Mchacha	6	6
998-72	Chikwanda	Chikwanda	Chikwanda	7	7
998-73	Siwango	Siwango	Kalewelewe	7	7
998-88	Kachere	Maluvenje	Maluvenje	4	4
998-90	Kawogha	Kawogha	Akimu	4	4
998-91	Tiwone	Chimpeni	Mponda	1	1
998-97	Gemu	Gemu	Mponda	6	6
999-21	Kadewere 1	Kaphalanya	Kaphalanya	6	5
999-31	Thokozani	Koloole	Koloole	11	11
999-35	Kadansana	Mthiko	Wimbe	3	3
999-40	Abale Sakondwera	Sizinire	Sizinire	6	6
999-63	Kachere	Koloole	Koloole	3	3
999-69	Tithandizane	Titani	Chakwanira	5	5
999-88	Kadewere 11	Mafuta	Kapinya	5	4
999-92	Vigando	Chavwerema	Chavwerema	7	6
				1745	1655

ANNEX 7: NON-PERMANENCE RISK REPORT

In this section a number of documents are referred to in the explanation associated with the various risks. The list below indicates the sources of evidence that have been used to determine risk ratings:

1. Malawi Chamber of Commerce website; http://www.mccci.org
2. USA 2009 Investment Climate Statement - Malawi; http://www.state.gov/e/eeb/rls/othr/ics/2009/117353.htm
3. Malawi ranked top two on Peace Index; http://www.nyasatimes.com/national/malawi-ranked-top-two-on-peace-index.html
4. Assessment of fire activity and biomass burning in Malawi, 2000-2008, L.M. Rebelo
5. BERL Management Plan
6. Malawi Department of Climate Change and Meteorological Services website; http://www.metmalawi.com/climate/climate.php
7. Jatropha drought resistant species – ICRAF
8. Malawi National Land Policy, January 17th 2002
9. EIA Jatropha and Bio diesel: Environmental impact Assessment Draft Report, March and July 2009, Water Waste & Environment Consultants
10. Investment agreement with milestones and requirements; commitment of TNT to BERL to 2014 based on milestones (exit moments)
11. BERL updated business plan 2009
12. Annual Economic Report 2009, Budget Document No2, Ministry of Development Planning and Cooperation, Malawi Government, 132 pp.
13. SEIA WACO (2009) Baseline study of a Jatropha Curcas out grower project for biodiesel (SEIA), commissioned by WFP
14. BERL field manual
15. BERL (2008) Workshop report Shaping the biofuel industry in Malawi, organized by BERL, Lilongwe, 24th November 2008
16. Biodiversity Baseline Survey: Biodiversity Baseline Survey and assessment: Bunda agricultural college, October 2008, final version
17. Malawi Elections outcome 2009 http://www.eisa.org.za/PDF/mal2009eomr.pdf
18. Environmental Impact Assessment certificates
19. BERL Support from Ministry of natural Resources, Energy and Environment statement
20. Budget speech from the Minister of Finance 2010
21. Malawi Rainfall History 2011.doc
22. Earthquakes Malawi 1989 and 2010
23. FACT Foundation Jatropha Handbook March 2006
24. Malawi: The warm Heart of Africa; Renewable energy triple bottom line investment opportunity. Feb 2011.
25. Addendum to Investment Agreement Dated 7 March 2008.
26. BERL Business Case October 2011
27. TNT Annual Report 2008
28. Nkhoma S, 2011. Land Policy and Regulation in Malawi: Comments from the Local Lawyer
29. Iiyama M et al, 2011. Economics of Bio energy from Jatropha cucas: Promises, Opportunities and Constraints in Kenyan Context. http://www.worldagroforestry.org/downloads/publications/PDFs/PO09312.PDF
30. Department of Environmental Affairs, 2002. Malawi State of the Environment Report. http://www.sdnp.org.mw/
31. Ministry of Industry and Trade 2011. Request to speed up development on the bio-energy Manufacturing Company
32. Cash Out BERL October 2011
33. Wadonda Consult (2009). Baseline Study of a Jatropha Curcas Outgrower Project for Bio-Diesel

The determination of the risk is based on the 2011 AFOLU Non-permanence Risk Tool v3.0 and this section follows the structure and instructions of that tool.

INTERNAL RISK

Project Management		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Species planted (where applicable) associated with more than 25% of the stocks on which GHG credits have previously been issued are not native or proven to be adapted to the same or similar agro-ecological zone(s) in which the project is located.	Not applicable
b)	Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50% of stocks on which GHG credits have previously been issued.	Not applicable
c)	Management team does not include individuals with significant experience in all skills necessary to successfully undertake all project activities (ie, any area of required experience is not covered by at least one individual with at least 5 years experience in the area).	Not applicable
d)	Management team does not maintain a presence in the country or is located more than a day of travel from the project site, considering all parcels or polygons in the project area.	Not applicable
e)	**Mitigation:** Management team includes individuals with significant experience in AFOLU project design and implementation, carbon accounting and reporting (e.g., individuals who have successfully managed projects through validation, verification and issuance of GHG credits) under the VCS Program or other approved GHG programs.	Not applicable
f)	**Mitigation:** Adaptive management plan in place.	-2
Total Project Management (PM) [as applicable, (a + b + c + d + e + f)] Total may be less than zero.		**-2**

The cultivation of Jatropha is well known in Malawi and the region as a whole; it grows wild in many parts of the country (Ref No 9). Although the crop is not native to Malawi, it is adapted and suited to Malawi's agro-ecological zone. Globally, the introduction of Jatropha has been most successful in the drier regions of the tropics with an annual rainfall of 300 to 1000mm. Generally it grows in areas with average annual temperatures well above 20°C (Ref No 9). At a regional level, Jatropha has been proven to have a wide environmental adaptability (Ref No 29):

	Range	Optimal
Annual temperature(°C)	18 - 38°C	n/a
Annual rainfall (mm)	300 - 3,000m	1,000 - 1,500mm
Altitude	0 - 1,800mm	n/a
Soil	well drained, sandy soils with pH <9	

Table1: Range and optimal agronomic parameters for *Jatropha*

These preferred climatic conditions correlate well with Malawi's climate as the country receives between 800 and 1500mm of rainfall on an annual basis and has mean annual minimum and maximum temperatures of 10 and 35 degrees Celsius (Ref No 30).

Enforcement to prevent encroachment by outside actors is not required. The farmers are voluntarily growing Jatropha as a boundary crop; the land surrounding their plot is most probably owned by family and / or community members thus encroachment is not an issue. Since 2008, BERL has not been made aware of any instance of encroachment, furthermore BERL has not identified any outside actor that may be incentivised to encroach.

The BERL management team is highly experienced. Together, the top management (Laurie Webb & Sander Donker) have decades of experience with out-grower schemes and agricultural activities. Both are successful businessmen. The full-time management team is located on site (within 1 to 4 hours of travel from the project location). In addition, Senior Planting Technicians as well as Field Technicians are located in each district to support the communities.

On the carbon side, top expertise is provided through Silvestrum: the directors jointly have over 40 years of experience in project design, certification, project management, and have been engaged in climate change since the early 1990s. Silvestrum has formulated an approved VCS methodology (IFM) and an A/R CDM methodology, and is working on several others; the directors have formulated parts of the VCS standard; one of the directors was lead author on the ARR section of the VCS and has formulated the new section on peat land rewetting and conservation; the other director was a co-author on the REDD section of the VCS and merged the original VCS standard with the AFOLU guidance that became the 2007 VCS standard; jointly with a team of international scientists they are close to completing a CDM AR methodology for mangrove restoration; and, one of their projects is CDM A/R certified (Bolivia). They are often invited to speak at conferences, including the UNFCCC meetings and regularly publish sharing experiences in their work.

Adaptive management is in place as shown by the management plan (Ref No 5) and various SOPs integrate administration and field implementation with inspection and feedback loops to adjust and improve planning and management.

Financial Viability		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	• Project cash flow breakeven point is greater than 10 years from the current risk assessment	Not applicable
b)	• Project cash flow breakeven point is between 7 and up to 10 years from the current risk assessment	Not applicable
c)	• Project cash flow breakeven point between 4 and up to 7 years from the current risk assessment	1
d)	• Project cash flow breakeven point is less than 4 years from the current risk assessment	Not applicable
e)	• Project has secured less than 15% of funding needed to cover the total cash out before the project reaches breakeven	Not applicable
f)	• Project has secured 15% to less than 40% of funding needed to cover the total cash out required before the project reaches breakeven	Not applicable
g)	• Project has secured 40% to less than 80% of funding needed to cover the total cash out required before the project reaches breakeven	1
h)	• Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven	Not applicable
i)	• **Mitigation**: Project has available as callable financial resources at least	Not

	50% of total cash out before project reaches breakeven	applicable
Total Financial Viability (FV) [as applicable, ((a, b, c or d) + (e, f, g or h) + i)] Total may not be less than zero.		**2**

The cost and benefit analysis for the project reveals that break even is reached in year 2016. The "current risk assessment" is executed in 2011. Therefore, "Project cash flow breakeven point between 4 and up to 7 years from the current risk assessment" applies. Ref No 26.

The project has secured 8.4 million USD while the funding required is 12.4 million USD. On this basis 68% is secured. This means "Project has secured 40% to less than 80% of funding needed to cover the total cash" applies. Ref Nos 26 & 32

As to mitigation, 8.4 million USD will have been invested by the end of the 2011 – 2012 planting season, which is more than 50% of the total funding required. Ref No 26 & 32

Opportunity Cost		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	• NPV from the most profitable alternative land use activity is expected to be at least 100% more than that associated with project activities; or where baseline activities are subsistence-driven, net positive community impacts are not demonstrated	Not applicable
b)	• NPV from the most profitable alternative land use activity is expected to be between 50% and up to100% more than from project activities	Not applicable
c)	• NPV from the most profitable alternative land use activity is expected to be between 20% and up to50% more than from project activities	Not applicable
d)	• NPV from the most profitable alternative land use activity is expected to be between 20% more than and up to 20% less than from project activities; or where baseline activities are subsistence-driven, net positive community impacts are demonstrated	0
e)	• NPV from project activities is expected to be between 20% and up to 50% more profitable than the most profitable alternative land use activity	Not applicable
f)	• NPV from project activities is expected to be at least 50% more profitable than the most profitable alternative land use activity	Not applicable
g)	• **Mitigation:** Project proponent is a non-profit organization	Not applicable
h)	• **Mitigation**: Project is protected by legally binding commitment (see Section 2.2.4) to continue management practices that protect the credited carbon stocks over the length of the project crediting period	Not applicable
i)	• **Mitigation**: Project is protected by legally binding commitment (see Section 2.2.4) to continue management practices that protect the credited carbon stocks over at least 100 years	Not applicable
Total Opportunity Cost (OC) [as applicable, (a, b, c, d, e or f) + (g or h)] Total may not be less than 0.		**0**

Chapter 6 on stakeholder comments reaffirms that "the baseline survey has established both the likely positive and negative effects of Jatropha cultivation among smallholder farmers that are largely engaged in subsistence farming for their food security."

Project Longevity		
a)	• Without legal agreement or requirement to continue the management practice	= 24 – (30/5) = 18
b)	• With legal agreement or requirement to continue the management practice	Not applicable
Total Project Longevity (PL) May not be less than zero		**18**

Project longevity
In this case, the project longevity is the same as the crediting period (see Section 1.5). Project start: 8 July 2008, start date of planting included in this PD is 30 September 2009; Lifetime of the project: 30 years; Crediting period: 30 years.

Proof of title evidence
The contract between BERL and the club is a 10-year renewable contract. BERL has an outgrower scheme with farmers implying that the land ownership will stay with the farmers. It will be communal land or private land that the farmers will use. Communal land is at the disposal of the Traditional Authority in Malawi (the Group Village Chief). Customary land is all land falling within the jurisdiction of a recognized Traditional Authority, which has been granted to a person or group and used under customary land (Ref No 8). In the contract signed by the clubs, the village chief has to co-sign to confirm the allocation of communal land to this specific project. BERL prevents planting on unallocated communal land. The Senior Planting Technicians have been trained in this aspect and know how to secure the issue of land tenure. BERL is only signing contracts to work with growers and clubs in which the customary land tenure is clear and undisputed, and in which the Village Chief co-signs or confirms the deal. Customary land tenure is clear and undisputed. Landowners and farmer clubs engage on a voluntary basis led by the opportunity of a sustainable long-term income. The contract includes a clause regarding emissions rights and has been reviewed by local lawyers; While EIA stated: "Disputes over land ownership are likely to arise as people become aware of the financial benefits of planting Jatropha" this is unlikely to happen within the project since only approving allocated lands within clubs will be included.

This contract can be renewed every ten years to ensure that it is maintained for the entire project longevity. This project has opted for a renewable 10-year contract instead of a single 30-year contract for the following reasons:

- The current practical and research knowledge of growing Jatropha for bio fuel in Malawi is at its infancy stage. BERL is the industrial leader in growing Jatropha in Malawi; therefore it is not appropriate to request either party to sign a 30-year binding contract when notions in the context of Malawi are still being developed.
- The bio fuel industry within Malawi will be susceptible to changes in pricing and become more regulated; therefore, the 10-year renewable contract will allow BERL to reflect these industrial changes more effectively.
- Jatropha is a new additional cash crop for Malawian small-holder farmers, and most of the clubs have had no prior experience of growing Jatropha. Therefore, farmers are hesitant to sign a 30-year contract from the outset as this would mean that the current unknown responsibility would be passed through the generations.
- The life expectancy in Malawi according to World Development Indicators 2009 stands at 54 years.

Evidence from the tobacco industry shows that smallholder contract farming is a successful approach and one that is unlikely to change in the coming years; it is the accepted method of growing crops in Malawi. As a company, BERL will invest 15.5 million USD into the bio fuel industry in Malawi, which will solely rely on seed bought from these smallholder contract farmers.

BERL's business case relies on the fact that the Jatropha will stand for 30 years. If there was doubt over the longevity of the project then the company would not be willing to rely on this source of seed. The economic underpinning of the company ensures that the trees will continue to be managed.

Commitment from the Government of Malawi has been given through the approval of the Environmental Impact Assessment (Ref No 18). Supporting statements have been given from the Ministry of Natural Resources, Energy and Environment (Ref No 19); the Ministry of Industry and Trade (Ref No 31); and the Minister of Finance, stating support for financial (tax) incentives (Ref No 20) for the bio fuel industry and more specifically BERL. There are no national laws or community regulations, which stand in the way of the continuation of BERL's management practices for a period of at least thirty years. The National Land Policy adopted in January 2002 by the Government of Malawi, The Constitution, The Land Act of, effectively ensures security of tenure in a number of ways (Ref No 28).

Management and financial plans
For all AFOLU project types, the entire project longevity shall be covered by management and financial plans as submitted to local government or financial institutions, or otherwise made public, in which the intention to continue management practices is stated and planned for, and may include external evidence such as municipal land-use plans, institutional structures, or tools such as ecological-economic zoning.

BERL has made presentations of their project to the Malawi Government and distributed a detailed investment memorandum to a dozen organisations without a non-disclosure agreement. (Ref No 24).

Harvesting
There will be no harvesting of trees.

Internal Risk	
Total Internal Risk (PM + FV + OC + PL) Total may not be less than zero.	**18**

EXTERNAL RISKS

Land Ownership and Resource Access/Use Rights		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	• Ownership and resource access/use rights are held by same entity(s)	Not applicable
b)	• Ownership and resource access/use rights are held by different entity(s) (e.g., land is government owned and the project proponent holds a lease or concession)	2
c)	• In more than 5% of the project area, there exist disputes over land tenure or ownership	Not applicable
d)	• There exist disputes over access/use rights (or overlapping rights)	Not applicable
e)	• **Mitigation**: Project area is protected by legally binding commitment (e.g., a conservation easement or protected area) to continue management practices that protect carbon stocks over the length of the project crediting period	Not applicable
f)	• **Mitigation**: Where disputes over land tenure, ownership or access/use	Not

	rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify overlapping claims	applicable
Total Land Tenure (LT) [as applicable, ((a or b) + c + d + e+ f)] Total may not be less than zero.		**2**

See Sections 1.7 and 7.1 for a description of the land tenure and the outgrowers system in Malawi.

The land is predominantly in private hands; it has been allocated to individual farmers by the chief for indefinite use. A very small proportion of the land on which hedges are planted is allocated communal land, in which case the land is community land under community management. The contract between BERL and the club is a 10-year renewable contract. See Project Longevity for further justification.

Disputes:

- There are no disputes and land needs to be properly allocated and put forward to the grower's club on a voluntary basis. All inclusions have to be endorsed by the Village Headman; the Group Village Chief, who will maintain the endorsement because it implies an improvement on the cash economy of his or her village and better fertilisation of land by seed residue, given ever degrading land without the project.
- Once the Jatropha is established and starts to generate an income, it is unlikely that the plants will be removed as harvesting is very easy.
- The chances that disputes will arise over the division of the income are non-existent as up front it is agreed that the money will be distributed based on the number of surviving trees counted by the Field Technician.
- The contracts that BERL signs with the growers club are a clear endorsement.

Community Engagement		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	• Less than 50 percent of households living within the project area who are reliant on the project area, have been consulted	Not applicable
b)	• Less than 20 percent of households living within 20 km of the project boundary outside the project area, and who are reliant on the project area, have been consulted	Not applicable
c)	• **Mitigation**: The project generates net positive impacts on the social and economic well-being of the local communities who derive livelihoods from the project area	-5
Total Community Engagement (CE) [where applicable, (a+b+c)] Total may be less than zero.		**-5**

All households that are reliant on the project area are consulted (100 percent). BERL field technicians visit villages that express an interest in growing Jatropha; during these sensitisation meetings the context of the Jatropha project is explained, each household decides whether they would like to participate in the project.

This project plants hedges around agricultural fields, without any significant impact on food production and criteria listed in the tool. (Ref No 13).

Evidence that the project generates net positive impacts on the social and economic well-being of the local communities who derive livelihoods from the project area is provided in the World Food Programme's Baseline Study of a Jatropha Curcas Outgrower Project for Bio-Diesel (conducted by Wadonda Consult) (Ref No 33). This Socio-Economic Impact Assessment was completed in 2009, it

states that "the baseline survey has established both the likely positive and negative effects of Jatropha cultivation among smallholder farmers that are largely engaged in subsistence farming for their food security. The positive effects include high willingness to grow Jatropha as an additional cash crop, potential to enhance the incomes of smallholder farmers, the commercialisation of farming activities, access to extension services and promotion of savings through linkages to financial institutions. The negative effects include the potential to crowd out food crop production and replacing of existing trees or natural forest as area under Jatropha cultivation expands." BERL is actively mitigating against the likely negative effects; boundary planting prevents the crowd out of food crop production and the land eligibility criteria prevents farmers replacing existing trees or natural forests with Jatropha Curcas.

Political Risk		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	• Governance score of less than -0.79	Not Applicable
b)	• Governance score of -0.79 to less than -0.32	4
c)	• Governance score of -0.32 to less than 0.19	Not Applicable
d)	• Governance score of 0.19 to less than 0.82	Not Applicable
e)	• Governance score of 0.82 or higher	Not Applicable
f)	• **Mitigation**: Country is implementing REDD+ Readiness or other activities, as set out in this Section 2.3.3.	Not Applicable
Total Political (PC) [as applicable ((a, b, c, d or e) + f)] Total may not be less than zero.		**4**

According to the World Bank Institute Worldwide Governance Indicators for Malawi the average governance score on the basis of the 6 indicator values for the last 5 year of available data (2005-2009) is -0.39. See table for Malawi below.

Year	**2009**	**2008**	**2007**	**2006**	**2005**
voice and accountability	-0.22	-0.24	-0.25	-0.29	-0.51
political stability and absence of violence	-0.06	-0.09	-0.01	0.00	0.029
government effectiveness	-0.52	-0.58	-0.51	-0.86	-0.72
regulatory quality	-0.53	-0.51	-0.42	-0.57	-0.48
rule of law	-0.19	-0.18	-0.29	-0.36	-0.18
control of corruption	-0.47	-0.54	-0.7	-0.64	-0.79
Rounded averages over 2005-2009	**-0.33**	**-0.36**	**-0.36**	**-0.45**	**-0.45**

(source: info.worldbank.org/governance/wgi/index.asp)

Having made the assessment, the following mitigating points can be brought forward:

- Since 1994, there has been a democratic government. The Malawi Chamber of commerce website (Ref No 1) states: "Even more important are the facts that Malawi has a stable political environment; a friendly, kind and well trained hard working English speaking people; and a

liberalized economy where companies operate and access opportunities without government interference. The government's efforts aim to facilitate, rather than to regulate private investment".

- Malawi ranks two in Africa in the Peace Index (Ref No 2); Presidential decrees setting minimum prices resulting in the departure of part of the industry (tobacco 2009 did not comply with agreement and were expelled) or bankruptcy (cotton 2009 could not meet minimum price requirements). Minimum price is likely to exist in midterm, but can be negotiated with government given the proven relationship that BERL has with the government. (see drafted TOR from Ministry of Finance for pricing model proposal)

The USA Investment index for Malawi is generally positive (Ref No 2); If political stability is low, then still the carbon sink may be safe, as the project will provide fuel to the Malawi economy making it less dependent on import, adding to fuel security. This is a benefit that supports policies of all sorts. BERL has and intends to continue to have good relationships with the government and the entire sector.

External Risk	
Total External Risk (LT + CE + PC) Total may not be less than zero.	**1**

NATURAL RISKS

The EIA also identified some non-permanence risks (although they do not use that particular term) and as a total concludes that the project has both positive and negative impacts, and that the positives outweigh the negatives. It has prepared a table in which the relation between the positive and negative impacts can be observed, and in which mitigation measures are proposed.

The EIA has used a scoring method to determine the relative importance of the different impacts, using a framework of EIA sector specific guidelines for Malawi. Explanation of this scoring framework used by the EIA is as follows: "The potential negative and positive impacts were evaluated in line with the methodology used in the EIA Sector Specific Guidelines for Malawi (1997), in terms of their magnitude and extent, significance, probability of occurrence and duration, using the scales of 1 to 5 as demonstrated in Table 5.1 [of the EIA]. A score of –1 or +1 denotes the least severity or least benefit while a score of -5 or +5 represents the highest severity or benefit of impact. Results of the evaluation are presented in Table 5.3A and 5.3B [of the EIA] for the negative and positive impacts respectively. The scores were added up to determine aggregates for each impact, as can be noted from the table. BERL will have to pay particular attention to the impacts with high negative aggregate scores, especially those with total scores of -10 and above."

More details on the EIA can be found in Chapter 5.

Natural Risk (Fire)	
Significance	Major (25% to less than 50% loss of carbon stocks)
Likelihood	Less than every 10 years
Score (LS)	20
Mitigation	0.5

Natural Risk (Pest and Disease outbreaks)	
Significance	Insignificant (less than 5% loss of carbon stocks) or transient (full recovery of lost

	carbon stocks expected within 10 years of any event)
Likelihood	Less than every 10 years
Score (LS)	2
Mitigation	0.5

Natural Risk (Extreme Weather)	
Significance	Major (25% to less than 50% loss of carbon stocks)
Likelihood	Every 10 to less than 25 years
Score (LS)	5
Mitigation	1

Natural Risk (Geological risk)	
Significance	No Loss
Likelihood	Less than every 10 years
Score (LS)	0
Mitigation	1

Score for each natural risk applicable to the project (Determined by (LS × M)	
Fire (F)	10
Pest and Disease Outbreaks (PD)	1
Extreme Weather (W)	5
Geological Risk (G)	0
Other natural risk (ON)	0
Total Natural Risk (as applicable, F + PD + W + G + ON)	**16**

Fire
Evidence: Ref Nos 4 and 5.
Fire is the most significant threat to both plants and animals in most of the sites studied. Burnt vegetation was recorded in just over one third of all vegetation plots sampled, increasing the susceptibility of the prospective species to future fire disturbance. As mitigation measures, firebreaks are made on the sites and dry vegetation are removed in the dry season (Ref No 4); the fire regime determines the baseline case and so it is an important risk factor in the project case. Total risk depends largely on management measures. A SOP is present and the project must ensure its implementation. Ground fires in maintained fields are not intensive and Jatropha plants are in principle fire resistant. Plants will recover from burnt leaves. In such cases the carbon stock is not affected as the plants will survive and continue to grow in the next growing period. In case of idle land with shrubs, the fire will be more intense and cause greater damage. This is, however, a small minority of cases. Expert opinion (Mr. Ab van Peer): usually, ground fire in the region is not damaging plants after 2 years. Trees drop their leaves - a season's harvest is lost – and they recover the same year. Thus, mitigation measures are particularly important in the first 2 years. Proof of best practice: interview with Dr. Trent Bunderson. However, as no solid scientific or empirical evidence is published yet, it is prudent to make a conservative reservation for the risk of fire in the quantification of the buffer.

Countermeasures are implemented and adequate for the situation; a documented management system is in place with risks identified, reduction targets established, procedures and assigned responsibility, internal auditing, reviews and training. SOPs are being followed in practice.

Risk of pest and disease attacks
Evidence: Ref Nos 5 and 23 plus SOPs
Currently, pests have not affected Jatropha plantations severely. The main pests are golden flea beetles, grasshoppers and red spider mites. Problems encountered include leaves attacked by golden flea beetle that sucks the sap and kills the leaves and can also damage the growing point. Grasshoppers eat the leaves but only in small amounts. A nest of caterpillars on the stem will eat the growing point. These may be larvae of the grasshoppers. Red spider mite has been seen on the leaves and does a lot of damage. One instance of leaf miner has destroyed the leaves on many plants but plants grow back. In all cases where the trees suffer attack from pests most is when stressed from rough treatment or small planting stations. Good ground preparation and the application of manure/compost have been found to be the best prevention. Jatropha is toxic to most normal pests, not all. Chemicals are available. Management measures: spray on-demand by field staff against pests and large plantations are absent. The project will adapt to yet unknown P&D by improving and extending SOPs. Risk is commercial rather than carbon related. SOPs are being followed in practice.

Basic assumptions for rating: Some occurrence each year in the entire project, damaging up to 5% of plants (without countermeasures; plantations are very disperse). Countermeasures are implemented and adequate for the situation, documented management system in place with risks identified, targets for reducing them established, procedures and assigned responsibility, internal auditing, reviews and training.

Extreme weather events
Jatropha needs a mean annual rainfall of 300-1000 mm or more (Ref No 6 and 7). Malawi has an overall rainfall of over 600mm. BERL is active in districts that have an annual rainfall of over 600mm (Ref No 20). So these climatic conditions are perfect for growing Jatropha.

A cool, dry winter season is evident from May to August. Extreme conditions are scarce but include the drought that occurred in 1991/92 season and floods of 1988/89 season (Ref No 6). Jatropha is a very drought-resistant species (Ref No 7). However, evidence that determines the significance of loss through drought, in terms of carbon stocks, is not yet readily available. Flooding-prone areas are not eligible (SOP says waterlogged but in practice is also extended to land prone to flooding).

Basic assumptions for rating: Once every 10 to <25 years, destroying 25 to <50% of the plantations. Jatropha is drought tolerant, but an extended drought period will kill some of the plants.

Geological Risk
Malawi is located in the Rift Valley. This rift has been responsible for the two earthquakes that have happened in the last 20 years. Along the lakeshore there have been 2 earthquakes, one in 1989 in Karonga (BERL is not active in that area and also will not expand), and one in 2010 also in Karonga and further down the lakeshore along Salima and Ntcheu. Salima is an area where BERL is active but so far the damage has been restricted to houses not to agricultural crops (see Ref No 22).

OVERALL NON-PERMANENCE RISK RATING AND BUFFER DETERMINATION

OVERALL RISK RATING

Risk Category	Rating
a) Internal Risk	18

b) External Risk	1
c) Natural Risk	16
Overall Risk Rating (a + b + c)	**35**

Eligibility Criteria for Future Instances
The VCS Grouped Projects guidance requires each additional 'instance' complies with non-permanence risk criteria sufficient to ensure that each new instance of the project activity does not exceed the project risk class in each risk category. Such criteria shall be risk-category specific.

The following list summarizes the risk factors and criteria for additional instances:

1. The project management of new instances shall not exceed the risk score for project management, with the following criteria:
    a. Species planted are Jatropha or others proven to be similarly adapted to the same or similar agro-ecological zone(s) in which the project is located.
    b. Ongoing enforcement to prevent encroachment by outside actors is not required to protect more than 50% of stocks on which GHG credits have previously been issued.
    c. Management team includes individuals with significant experience in all skills necessary to successfully undertake all project activities (ie, any area of required experience is not covered by at least one individual with at least 5 years experience in the area).
    d. Management team maintains a presence in the country or is not located more than a day of travel from the project site, considering all parcels or polygons in the project area.
    e. An adaptive management plan is in place
2. New instances must be covered by contracts with the out growers that have at least the same duration as the contracts covering this instance.
3. The eligibility criteria for land tenure must remain in place and be assessed for each new instance.
4. Community engagement and project endorsement by the local communities must be demonstrated by the voluntary character of the out growers' participation in the project. The project generates net positive impacts on the social and economic well-being of the local communities who derive livelihoods from the project area.
5. The new instances must be subjected as a minimum to the same Mitigation Measures as the 1st instance to contain the risk associated with natural phenomena and must meet project eligibility and site selection criteria and be implemented according to standard procedures, as defined in various SOPs (e.g. covering site selection and land preparation). This also addresses the risk associated with project longevity, ownership and user rights.
6. To address regulatory and social risk: additional instance must be located inside Malawi.

No additional criteria are required to ascertain the technical and financial capabilities of the project as new instance will benefit from BERL's capacity once the project is validated and being implemented as per PD.

CALCULATION OF TOTAL VCUS

The number of buffer credits to be deposited in the AFOLU pooled buffer account for this instance, based on the non-permanence risk assessment, equal 9,057 t CO2. Therefore the number of GHG credits eligible to be issued as VCUs in this instance equal 16,821 t CO2.

The buffer withholdings for the project case, based on the non-permanence risk assessment equal 854,720 t CO2. Therefore 1,587,337 t CO2 are eligible to be issued as VCUs.