BTC CTB

BELGIAN DEVELOPMENT AGENCY

SUPPORT PROGRAM TO THE REFORESTATION IN 9 DISTRICTS OF THE NORTHERN AND WESTERN PROVINCES OF RWANDA (RWA 080631T – 18841 AMB/PB)

FINAL REPORT

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ABBREVIATIONS

CPS : Current Productivity Scenario
BEST : Biomass Energy Strategy of Rwanda
BNR : Rwanda National Bank
BTC : Belgian Technical Cooperation
CDC : Community Development Committee
CDF : Common Development Fund
CGF : Forest Tree-Seeds Centre
C-GIS : Centre Geographic Information Systems
CI : International Consultant
CN : National Consultant
DD : District Development Plan
DELCO : Co-management Delegate
DFMP : District Forest Management Plan
DFO : District Forest Officer
DI : Director Intervention
DFNC : Department of Forestry and Nature Conservation
EDPRS : Economic Development and Poverty Reduction Strategy
EKN : Embassy of the Kingdom of the Netherlands
EMS : Multi Service Enterprise
FAO : Food and Agriculture Organization
GDP : Gross Domestic Product
GIS : Geographical Information System
GIZ : German Society of International Cooperation
GPS : Global Positioning System
HIMO : High Intensity Labour
IFDC : International Centre for soil Fertility & agricultural Development
ITA/ATI : International Technical Assistant
ISAR : Rwanda Institute for Agronomic Sciences
JAF : Joint Action Forestry/Joint Action Forum
JAFD : Joint Action Development Forum
MPS : Managed Productivity Scenario
MAI : Mean annual Increment
MINAGRI : Ministry of Agriculture
MINALOC : Ministry of Local Government
MINIRENA : Ministry of Natural Resources
MININFRA : Ministry for Infrastructure
M&E : Monitoring & Evaluation
MoU : Memorandum of Understanding
MTR : Mid Term Review
NAFA : National Forest Authority
NTA : National Technical Assistant
NUR : National University of Rwanda
OVI : Objective Verifiable Indicator
PAREF Be I : Reforestation Support Program in 6 Districts of the Northern and Eastern Provinces of Rwanda
PAREF Be II : Support Program to the development of the Forestry Sector in Rwanda
PAREF NL : Reforestation Support Program in 9 Districts of the Northern and Western Provinces of Rwanda
PMU : Project Management Unit
RAB : Rwanda Agricultural Board
REMA : Rwanda Environment Management Authority
RNRA : Rwanda National Resources Authority
PO : Program Officer
RPPA : Rwanda Public Procurement Authority
SACCO : Saving and Credit Cooperative
SC : Steering Committee

SDA : Schéma Directeur d'Approvisionnement des villes en combustibles ligneux
SEW : Sustainable Energy through Woodlots and Agroforestry
SFM : Sustainable Forest Management
SIEP : Permanent Evaluation and Information System
SMFR : Sustainable Management of Forest Resources
SNV : Netherland Development Organization
SPAT : Strategic Programme for the Agriculture Transformation
SPOT : System for Earth Observation
TA : Technical Assistance
TL : Team Leader
TFF : Technical and Financial File
TOF : Trees Outside Forests
TROF : Tree Resources Outside Forests
UNDP : United Nations Development Program
VAT : Value Added Tax
WB : World Bank

EXECUTIVE SUMMARY

This report outlines the achievements of the PAREF NL (RWA 080631T) program. The Program was implemented from 22nd December 2008 to 31st March 2013, by RNRA/DFNC with Technical Assistance support from BTC. The total Netherlands contribution was € 10,000,000 and Rwandan contribution was € 200,000 plus tax exemptions.

The overall objective of the project was: **The implementation of the National Forest Policy contributes to poverty reduction, economic growth and environmental protection.** In order to reach this specific objective, three result areas were defined:

- **Institutional capacities at the decentralized level regarding afforestation and management of forestry resources are reinforced;**
- **The forest resources in 9 districts (7 in western and 2 in northern province) are increased and diversified and their management improved;**
- **A better valorisation of forest products should be assured;**

In by most of the result areas the project has successfully achieved its objectives measured by objective verifiable indicators outlined in the project log frame.

The most important result to achieve was the afforestation objective. Eighty eight (**88%**) percent of the project finances went into this activity, resulting in a average cost per hectare of **954 euro** which stands at normal levels, underlining a good project efficiency. Based on original method of plantation measurement (1 hectare = 1600 plants) the project achieved **10,524 ha**.

The project launched in 2012 an intensive mapping campaign, involving District DFOs, Operators and GIS specialists, in order to measure all PAREF Nl sites. All sites were GPS measured and corrected for slopes. The total GPS project area achieved is **9,422 ha (94%).**

All district and sector maps regarding Forest cover are updated by using 2008-10 ortho photos. The final report was produced and validated. The control mission was carried out and the final report of the C-GIS was approved in February 2013. Two sets of maps (902 maps) and 10 maps of Rwanda forest cover were printed (Rwanda, Provinces, Districts and Sectors) in March. All data was put on a DVD (Maps in PDF, Maps for Web mapping and GIS data). For Western province the forest cover (without lakes and including shrub land) is **146,157 ha or 30.01 %.** For the 2 Northern provinces Burera and Musanze the forest cover (without lakes and including shrub land) it is **23,169 ha or 21 %.** The average for the whole project are is about 24.26%. These figures are without the established PAREF plantations. Adding would increase the average cover for the project area with 1.34 % to **25.6%**

A charcoal making census was held in all 9 project districts and 90 charcoal makers (10 per district) were trained in improved carbonization techniques and proper exploitation techniques. According to the impression of trainees, the use of a more modern carbonization technique has doubled the quantity of charcoal, much improved the quality of charcoal produced, the carbonization process time has been reduced by 2 and pollution drastically reduced. The trainees also observed the recovery of creosote water and tar, which has an added value and can be sold and used as treatment of timber. Acceptance to use the kiln was 100%. However further follow up in the years to come will tell how many of them will continue to use the kiln. The value chain study (SDA) has been carried out by PAREF Be-2.

Several training/capacity building exercises on sustainable forest management where held for all project and district DFO staff. The topics where tree measurement, forest inventory and stand management, exploitation, and decentralized management. The training sessions where attended by project field staff, department DFOs from all 9 districts and representatives from DFNC HQ.

The project obtained the softcopies of the DFMPs for PAREF NL districts in May 2012. A first assessment of their accuracy was not satisfactory. In order to use them, let develop management tools for them, they first have to be refined and updated. It is important that the national mapping update and PAREF NL area measurement and control is finalized. As this was realized by end 2012, there was time to develop tools.

As the forest law and rules/regulations to base the guide on, were not yet approved and/or developed by Rwanda, related management tools could not be developed. A detailed assessment of achievements against results is shown in **chapter 3.1**

Chapter 3.2 reviews the assumptions and risks as outlined in the original TFF log frame. Most of them are still valid and some are partly valid. The risks regarding state land intended to have forests is maintained and availability of well-trained operators are not valid any more.

Based on the update of the national forest cover, it is currently accepted that the national forest cover is approximately **673,516 ha or about 28.29 %** of the country with a large proportion of shrub lands and badly managed plantations. This figures are based national land area, excluding lakes and including all areas up to 0.25 ha. If the results of PAREF Be1 (2,923 ha) and PAREF Nl (9,422 ha) are added, the forest cover increases **0.52 %** up to **28.81 %.**

Based on the November 2012 SDA or Supply Master plan for Fuel wood and Charcoal of Kigali study (which was updated with the results of the 2012 Forest Cover Mapping) it is estimated that 5.2 % of land cover (TOF = Trees Outside Forests) was taken by agroforestry plots (< 0.25 ha) and individual trees. This 5.2 % is not part of the 28.81% forest cover. Even if only half of the 5.2 % is added the forest cover is already well above the 30% level of the Vision 2020 objective. Adding the full 5.2 % will give a **cover of 34 %.** Reaching and even surpassing the 30 % indicator of Vision 2020 would mean a huge achievement of the RNRA and the Forest Department. It calls for a change in strategy, towards improvement of (participative) forest management and increase of biomass productivity per ha from 9.6 m^3/ha (CPS) = Current Productivity Scenario) to 15 m^3/ha (MPS=Managed Productivity Scenario) or more.

During its implementation the project faced a number of challenges and issues, which were dealt with as far a possible or reduced by mitigating measures. They are outlined in chapter 4.

Extending a project forestry life span up to 6 years or more (in line with first biomass energy plantation rotation) would considerably improve the output in terms of output, cost-effectiveness and durability.

The achievement of a 30% forest cover long before 2020 creates an opportunity to shift the forest cover strategy towards a forest management and productivity improvement strategy.

Experimenting with participatory forest management through identified, organized and active cooperatives or associations could be an opportunity to come to sustainable forest management and protection of the public forest plantations, and ensure stable income (through benefit sharing between cooperatives, districts and RNRA/DFNC.

Table 6 and 7 on page 30 show simulations of opportunities in possible harvesting revenues after 4 and 7 year rotations. Under the CPS (Current Productivity Scenario with mean annual increment of 9.6 m3/ha/year), brut revenue at the end of first 4 year rotation would be € 4,653,798, based on 25 % production for charcoal and 75% for fire wood. For a 7 year rotation this would be about € 8,144,147 (project investment =9,420 *954€ = € 8,986,690) Even with this very low productivity rate, break-even is almost achieved after the first seven year rotation (without taking into account accumulated interest).

When management of plantations is approved (Managed Productivity Scenario) and productivity is increased to 15 m3/ha/year, the figures increase with about 56% to €7,271,559 (4 year rotation) and € 12,725,229 (7 year rotation). Based on 4 rotational periods of 7 years, a total brut revenue could be reached of € 50,901,196 after 28 years. A production up to 23 m3/ha/year is feasible on good soils and abundant rainfall and has already been achieved in Rwanda under field conditions. Brut revenue for a 7 year rotation would be € 19,512,018 or 10,530,328 (minus PAREF initial investments), creating a brut profit of **€ 160/ha.**

Based on challenges, issues and opportunities identified during the project implementation lessons can be learned. These lessons are outlined in chapter 5.

In a relatively short period of 3 years PAREF NL has achieved most of its objectives except those related to District Forest Management Plan updates and implementation. The overall execution rate of the project by the end of April was **99.12 %**

All in all it can be concluded that the project was successful, thanks to active involvement of Districts, MINIRENA, RNRA/DFNC, operators, a dedicated project team and of course thousands of labourers without whom the biomass energy plantations would never be established.

A phase 2 for PAREF Nl of 4 years is needed to take care of young biomass energy plantations (maintenance and protection) handed over to Districts and DFNC, to experiment with and initiate participatory management of the established biomass energy plantations in order to show financial feasibility of these plantations, thus attracting future investments to safe guard Rwandese forest plantations.

Indicators on production of biomass and management of plantations (on private and public land) should be incorporated in the Strategic Plan for Forest Sector - 2013-2015 and collection on forest statistics should become a priority for DFNC, in order to get an idea of contribution of the forest sector to the GDP of Rwanda. Proper statistics will show that the contribution of the forest sector is highly underestimated and could trigger more Government investment in the sector.

Based on findings of the Forest Cover Mapping update and FAO Wisdom findings on the percentage of trees outside forests, it almost certain that the 30% cover set as objective in Vision 2020 is reached. It is therefore recommended that a strategic shift from planting towards management and productivity increase should take place in the forest sector.

A joint donor review of the forest sector should take place in 2014 in order to come to a nationwide support strategy for the sector in line with Rwanda policies as from 2016.

PROJECT CARD

Title of the assignment/service	Support Program to the Reforestation in 9 districts of the Northern and Western Provinces of Rwanda
Partner country	RWANDA
Navision Code BTC	RWA 080631T
Sector (CAD code)	31210
Netherlands intervention N°	18841
Partner institution	Ministry of Natural Resources (MINIRENA)
Partner Country Contribution	200.000 € plus tax exemptions
Netherlands Contribution	10.000.000 €, including an evaluation budget
Total Contribution	10.200.000 €
Intervention duration	43.5 months for implementation (including 7.5 months prolongation) and 6 month for closing the project
Starting Date	Effective start of the intervention : 01/01/2009
Brief description of the intervention	Overall objective : The implementation of the National Forest Policy contributes to poverty reduction, economic growth and environmental protection
	Specific Objective : The qualitative and quantitative degradation of forest resources is controlled and the fuel wood needs of Rwanda are better assured
	In order to reach this objective : • Institutional capacities at the decentralized level regarding afforestation and management of forestry resources are reinforced • The forest resources in 9 districts (7 in western and 2 in northern province) are increased and diversified and their management improved • A better valorisation of forest products should be assured

1 INTRODUCTION

Before the war in April 1994, under the coordination of the then Ministries of Public Works, Energy and Water and Agriculture, Livestock and Forestry a number of projects had worked on conservation techniques of wood energy through manufacturing and dissemination of improved stoves for cities and rural areas and by improved carbonization.

Among these projects, there was especially "Improved Stoves for Charcoal and Carbonization Techniques" funded jointly by the Dutch Government and United Nations Development Program (UNDP)," "Save Firewood" "supported by the Association of Netherlands Development Organization (SNV) and "Special Energy Program" implemented by the German Organization for International Cooperation (GIZ).

Between 2008 and 2012 the Netherlands Government decided to support two major interventions in the sector. The Agroforestry International Centre for Soil Fertility and Agriculture Development (IFDC) implemented Sustainable Energy Production through Woodlots and Agroforestry Project (SEW)

The overall objective of the project was to decrease land competition between energy production and agricultural production by increasing agricultural productivity and income. Over the life of the project, more than 30 million tree seedlings have been planted on private land. Specific objectives of included:

- Increased production of fuel wood through micro-woodlots and profitable agroforestry systems
- Effective and operational fuel wood and charcoal value chains
- A favourable environment for the development of a profitable fuel wood sector

The second major intervention funded by the Netherlands was the Support Program to the Reforestation of 9 Districts of Northern and Western Provinces of Rwanda (PAREF Nl-1).

The formulation of the program was based on the following strategic directions:

1. Focusing the intervention on increasing fuel wood resources.

For many years, the balance between supply and demand for fuel wood (firewood, charcoal) is widely at deficit, and this trend continues to worsen particularly because of continued population growth in the country (see Study BEST). The deficit in 2002 was estimated at more than 6.7 million cubic meters. Although this estimate should be considered with caution, (it does not include the contribution of agro-forestry, or the use of plant debris), obviously this fact and the overall trend require from all evidence significant efforts to reduce this deficit and curb its negative trend.

This being the case, that program took the direction of focusing its intervention on increasing the productive forest areas available, on one hand, and on a better utilization of fuel wood production, on the other hand.

2. Afforestation / conversion of forests on public lands

Under the program, it was decided to plant trees on new lands or convert forests which have become unproductive belonging to the public domain rather than develop agro-forestry in the private family holdings. This option was preferred on the basis of the following criteria:

- The program should provide support to districts as part of the implementation of their Forest Management Plan and the development of their productive forest heritage;

- Developing public forests leaves the State / district freedom to determine production targets and accept a certain usability sacrifice for the supply of domestic energy to consumers (public service as the Water);

- The establishment of afforestation on lands of larger size would allow for easier monitoring of their rational utilization and facilitates the structuring of the industry;

- The scope of the program for afforestation/conversion of 10,000 ha would, in the context of an approach to development of agro-forestry on private land, require the mobilization of several thousand farmers and result in a geographical dispersion / breakup ,an intervention extremely complicated to manage;

- The exploitation of forest resources developed in private holdings cannot be controlled. In these holdings, in most cases, farmers use the wood for construction, with accordingly an impact strongly limited on the supply of fuel wood, sought in this program.

The Program was implemented from 22nd December 2008 to 31st March 2013, by RNRA/DFNC with Technical Assistance support from BTC. The total Netherlands contribution was € 10,000,000 and Rwandan contribution was € 200,000 plus tax exemptions.

Two documents regulated the original execution of the projects' intervention:

- The agreement signed on 26/11/2008, between the Dutch Minister for Development Cooperation and the Belgian Development Agency (BTC) and,

- The Memorandum of Understanding signed on 22/12/2008, between the Belgian Development Agency and the Ministry of Natural Resources, for the implementation of the "Support Program to the reforestation in 9 districts of northern and western provinces of Rwanda and;

The operational life of the project was originally set at 3 years, with the last commitments to be completed no later than 31/12/2011 and was foreseen to be closed no later than 30/06/2012.

Based on the MTR recommendations to extend of the actual project phase till 31/12/2012 and the endorsement of these recommendations by the Steering Committee during its meeting of 29 September 2011, the PMU (after a request from the SC and EKN) developed an operational and financial planning (action plan 2012/13) for the period 1 January 2012 to 15 February 2013.

This effectively extended the operational life of the project with 7.5 months, with field activities to be halted by 30 September 2012. The closing date of the project would consequently be no later than 15 February 2013. The following addenda to the original agreement and MoU were made:

- The agreement addendum signed on 13th February 2012, between the Dutch Minister for Development Cooperation and the Belgian Development Agency (BTC) regarding the extension of the project up to 15 February 2012 and,

- The addendum to the Memorandum of Understanding signed on 9/05/2012 between the Belgian Development Agency and the Ministry of Natural Resources, for the implementation of extension period up to 15 February 2013 of the "Support Program to the reforestation in 9 districts of northern and western provinces of Rwanda

Based a concept note and correspondences between the Minister of MINIRENA and the EKN dated 22nd May 2012 and 2nd August 2012, EKN letter KIG/OS/B/269/2012 of 28 June sent to MINIRENA and discussions at EKN between BTC and EKN Head of Cooperation, BTC was requested in a letter from EKN date 9 October 2012 to develop a proposal for Phase 2. A draft TTF was send to EKN on 7 December 2012.

By the end of February it became clear that the estimated approval process for phase 2 was too optimistic and would take up to the end of May. The project was therefore assessed as too risky by BTC. The closing of PAREF Nl became a fact.

A new no cost extension budget was forwarded to EKN by BTC in its letter RWA080631T PB-OUT/13/125 dated 12 March 2013, with proposals for handing over plantations, equipment and deadlines for final technical and financial reporting. The budget and reporting proposals were approved by EKN in its letter KIG/OS/B/070/2013 dated 18 March 2013.

The following addendum to the original agreement was made:

- The agreement addendum signed on 11th February 2013, between the Dutch Minister for Development Cooperation and the Belgian Development Agency (BTC) regarding the extension of the project up to 31st March 2013

The overall objective of the project was: **The implementation of the National Forest Policy contributes to poverty reduction, economic growth and environmental protection.** In order to reach this specific objective, three result areas were defined:

- **Institutional capacities at the decentralized level regarding afforestation and management of forestry resources are reinforced;**
- **The forest resources in 9 districts (7 in western and 2 in northern province) are increased and diversified and their management improved;**
- **A better valorisation of forest products should be assured;**

2 PROJECT AND SECTOR BACKGROUND

PAREF Nl-1 is a forestry development program, which is implemented within the context of Rwanda's Development Policy, Vision 2020, the Economic Development and Poverty Reduction Strategy (EDPRS), the National Forest Policy, its National Agricultural Policy & Strategic Program for Agriculture, the decentralization policy, the Transformation Territory Administrative reform of 2006 and the Biomass Energy Strategy (BEST).

2.1 Rwanda Development Policy

A wise use of Environment and Natural Resources to achieve sustainable development in Rwanda will rely on better management of forests and biomass. The gap between demand and supply of timber and fuel wood (estimated at 6.7 million cubic metres) leads to an excessive use of forest resources. Similarly, land shortages due to high population density (density of 400 inhabitants per square kilometre) as well as degraded soils deepen poverty among rural dwellers who, in search of alternative income, overexploit natural forests and forest plantations for domestic and commercial purposes.

Therefore, the need to sustainably manage forests, increase forest cover and forest productivity and improve charcoal production efficiency in order to meet the national population demand in fuel wood consumption has to be addressed. The project will provide a modest contribution to the implementation of national strategies and priorities outlined in Vision 2020 concerning the forest sector, the Forest Policy and the Economic Development and Poverty Reduction Strategy phase two (EDPRS II)

These strategies and priorities are defined as follows: (i) Increase and diversification of national forest and agro forestry resources; (ii) conservation and sustainable rehabilitation of forest and agro forestry resources; (iii) assessment of the contribution of goods and services rendered by the forestry sector to the national economy; and (iv) development of innovative technologies and best practices in forests management.

2.2 Vision 2020

Adopted in 2000, Vision 2020 as the development roadmap seeks to transform Rwanda from an agrarian country of per capita income of USD 220 in the year 2000, to a knowledge-based middle income country with a per capita income of USD 1,240 by the year 2020. Founded on six thematic and three cross-cutting pillars, Vision 2020 recognizes sustainable environmental and climate change management as a cross-cutting crucial area regarding the realization of national aspirations.

It recognizes that the major problem in the field of environmental protection in Rwanda is the imbalance between the population and its natural resources. This leads to alarming degradation observed through deforestation, the depletion of biodiversity, erosion and landslides, pollution of waterways and the degradation of fragile ecosystems.

To protect the environment against deforestation and soil destruction, Vision 2020 sets the target for the forest cover to reach 30% of national land area (excluding lakes and rivers) by the year 2020 and the protection rate against erosion to rise from 20% in the year 2000 to 90% by year 2020. To ease the pressure on woody biomass (99% of the Rwandan population uses wood as the source of energy), Vision 2020 targets the share of wood energy in the national energy balance to drop from 94% in 2000 to 50% by the year 2020 through diversification of energy sources offered to the population. The implementation of this project will contribute to the targets of Vision 2020.

To protect the environment against deforestation and soil destruction, Vision 2020 sets the target for the forest cover to reach 30% of national land area (excluding lakes and rivers) by the year 2020 and the protection rate against erosion to rise from 20% in the year 2000 to 90% by year 2020. To ease the pressure on woody biomass (99% of the Rwandan population uses wood as the source of energy), Vision 2020 targets the share of wood energy in the national energy balance to drop from 94% in 2000 to 50% by the year 2020 through diversification of energy sources offered to the population.

2.3 Economic Development and Poverty Reduction Strategy

The Rwanda's Economic Development and Poverty Reduction Strategy (EDPRS I) for the period of 2008-2012 prioritizes forestry as a strategic sector for public intervention to limit natural resources degradation. Accordingly, the strategy recommends the Forestry Sector to design and implement a reforestation strategy with diverse species, an inventory and mapping of national forest resources to provide the basis for a ten year national forestry plan and a joint strategy with MINAGRI to promote agroforestry for non-wood uses, including medicinal uses, honey production, wild foods and handicraft production.

The strategy further proposes an increase in forest and agroforestry cover from 20 (2006/7) to 23.5% (2012) of total surface land area (this is equivalent to an increment of 89,583 ha); reduction of annual wood consumption by 30% from 2002; rehabilitation of degraded ecosystems such as Gishwati and Mukura by 80%; intensification of agroforestry up to 85% of farmlands and development of a strategy for involving the private sector in forest management.

The Rwanda's Economic Development and Poverty Reduction Strategy (EDPRS II for 2013-2018) prioritizes forestry as one of the pillars of National Economy where it recognise its contribution of about 13% (Baseline studies, 2010) to the Gross Domestic Product (GDP), therefore it recommends the increase of the contribution to GDP up to 15% by 2017. The Economic Development and Poverty Reduction Strategy for 2013-2018 also supports the previous target of increasing forest cover to 23.5% by 2012 and sets new indicator to reach 30% cover by 2018.

2.4 National Forest Policy

Rwanda's strategic objectives in the forestry include, among others: (i) increasing and diversifying national forest and agroforestry resources (Vision 2020 and Forest Policy); (ii) conserving and sustainably rehabilitating forest and agroforestry resources (Economic Development and Poverty Reduction Strategy and Forest Policy); (iii) Assessing the contribution of goods and services provided by the forestry sector to the national economy (forest policy); and (iv) developing an agriculture that seeks to preserve the environment and natural resources (National Agricultural Policy).

This project will help to implement national strategies and priorities contained in Vision 2020, the national poverty reduction strategy phase two Economic Development and Poverty Reduction Strategy (EDPRS-II), the national forest policy and the national agricultural strategy. Therefore, the project is relevant to the objectives pursued by Rwanda.

The first written national forest policy was published in 2004. Due to rapid socio-economic and political changes that occurred since then, the national forest policy has recently been revised to meet the new challenges facing the forest sector (Ministry of Forestry and Mines (MINIFOM, 2010).The revised National Forestry Policy has 14 guiding principles that will allow the Environment and Natural Resources Sector to achieve the forestry policy mission:

1. **Sustainable Forest Management (SFM):** To manage all forest and tree resources to yield sustainable streams of social, economic and ecological goods and services on order forestry needs of the current generation without compromising similar rights of future generations.
2. **Commercialization of Forestry Operations:** To carry out forestry operations in a business-manner, with clear focus on result-based management. Thus, the private sector will be invited and facilitated to invest in wood processing and value-addition in all mature forest biomass energy plantations.
3. **Species diversification:** To use a wide range of tree species in reforestation programs on the basis of species matching to site.
4. **Agroforestry technologies:** To promote on-farm forestry using multi-purpose fertilizer tree species due to land shortage for extensive forest biomass energy plantations.
5. **Ecologically and physically fragile areas**: To manage such areas with special care in order to conserve the biodiversity therein and to protect areas prone to soil erosion and landslides.
6. **Forestry research**: To take key forest management decisions based on fundamentals of forestry science and adequate research.
7. **Stakeholder involvement and partnerships:** To involve all key stakeholders in forestry at various levels (national, district and community) in decision-making.
8. **Forest management planning:** To manage forests in accordance with approved management plans to achieve well defined objectives irrespective of ownership.
9. **Private sector involvement:** To promote a systematic phasing in of the private sector to play leading role in forest management and processing of forest products, leaving the public sector only the regulatory function, research and quality assurance.
10. **Decentralized governance:** To manage all state forests in accordance with decentralized governance prevailing in Rwanda through "*Performance Contracts*".
11. **Forests as public good:** To manage all forests to serve a common good interest irrespective of ownership because of the multiple roles of forests. Therefore, any action taken in any forest will be regulated to safeguard that public interest.
12. **Livelihoods enhancement:** All strategies and interventions in the forest sector must be geared towards improvement of livelihoods and fighting poverty.
13. **Gender and equity**: To integrate assenting actions in all forest management plans to redress gender inequalities and disadvantaged groups.

International Obligations: To internalize current and future international conventions, agreements and protocols related to forestry in all strategies and interventions in the forest sector. The forestry policy sets clear strategies to achieve planned outcomes:

To increase forest cover

- To improve tree planting materials;
- To intensify tree planting on both public and private land;
- To promote silviculture treatment.

To sustainably manage forest biodiversity and critical ecosystems

- Rehabilitate degraded ecosystems;
- Expand the network of protected areas;
- Generate scientific knowledge on ecosystems and biodiversity management.

To increase sustainable contribution of forestry and nature conservation sub Sector to the national GDP

- Promote value added technologies to wood and non-wood forest products and services;
- Establish a proper forest data management system;
- Promote sustainable forest management.

2.5 National Agricultural Policy & Strategic Programme for Agriculture Transformation

In order to meet the ambitions set in the agricultural sector within the framework of the Vision 2020 and the Programme of Poverty Reduction, the Government of Rwanda adopted in October 2004 a National Agricultural Policy whose vision is oriented towards poverty reduction and the contribution to a sustainable food security thanks to:

- A family agriculture which is modernized, innovating, professional and specialized, generating employment and income and voluntarily oriented market (domestic, sub-regional, regional and international);
- An integrated and diversified agriculture and specialized at a regional level and which ensures the food safety of the population and an equitable distribution of the resources and incomes;
- An agriculture concerned about safeguarding the environment and natural resources.

The Strategic Programme for the Agriculture Transformation (SPAT) was adopted by the Government in January 2005 for the implementation of the National Agricultural Policy. The general objective of the SPAT is "to contribute in a sustainable way to poverty reduction and to support the economic growth of Rwanda through the increase in the productivity of production factors, the maximum valorisation of the productions, the diversification of income opportunities, the safeguarding and maintenance of environmental natural resources".

The SPAT recognizes the importance of the Peasant Organizations (POs) in the strategy and considers capacity building as one of the conditions for success. SPAT considers Peasant Organizations as a key partner and includes programmes for the support and increase in their participation in the process of agricultural development. The forestry sector has certainly lessons to draw from this strategy.

2.6 Decentralization

The process of decentralization is under the supervision of the Ministry of local administration (MINALOC). The administrative reorganization made it possible to redefine the new responsibilities meant for Local governments; from now ***Districts, Sectors, Cells*** become the implementation centre of the decentralization program. ***Districts*** play the role of coordination and development programs of the sectors and have the responsibility to allocate the resources necessary for their functioning. There are four strategic objectives of decentralization:

1. To make people aware of their responsibilities and mobilize them in order to involve them in the development, the implementation and the monitoring of development programs;
2. To reinforce transparency in the local authorities in order to hold them directly answerable vis à vis their communities;
3. To support, at the national level, a sensitivity to participatory development and to make local leadership able to facilitate structures which give priority to the needs expressed by the populations at the grass roots;
4. To develop a sustainable economic planning based on an efficient management of locally available resources

The decentralization policy was concretized by the adoption of the laws and regulations on the decentralization which made it possible to establish provinces and districts in 2001, the latter under the leadership of a Council and an Executive Committee elected with a 5 year mandate of.

Regarding forests, **the District Council** is responsible for taking decisions, develop strategies and give instructions relating to the activities aiming at developing agriculture, livestock and forests while the District Executive Committee is particularly responsible for the implementation of agriculture, livestock and forests, tourism and the environment conservation decisions.

i) This process of decentralization was accompanied by the development of policies (Community Development Policy and Tax Decentralization) and the establishment of the following structures and tools: Establishment of the Community Development Committees (CDC) which stimulated and promoted the participation of local governments and communities in the choice of development priorities and monitoring-evaluation of their implementation;
ii) Establishment of Joint Action Development Forum(JADF) which groups all development partners in each district;
iii) Creation of the Common Development Fund (CDF) which receives 10% of the internal receipts of the country to build the capacity of decentralized entities with regard to the funding of the development projects;
iv) Development of the Districts Development Plans (DDPs)

The major changes brought by this context of decentralization on the functioning of state institutions and the various development actors came from the definition and the sharing of roles and responsibilities between the central Government Ministries and the delegated entities (Provinces) and decentralized entities (Districts, Sectors, Cells). These changes were especially characterized by:

i) Increased transfer of responsibilities to Provinces and Districts in the matter of coordinating and implementing development activities (planning, prior consent to the action on field for a particular stakeholder, monitoring and evaluation, etc.);
ii) Transfer of responsibilities for collecting some taxes;
iii) Direct transfers of budgets of the Central Government to the Local Governments;
iv) Possibility of signing partnerships directly with some donors;
v) District accountability in the management of project funds from bilateral & multilateral co-operation.

The evaluation of the second phase of decentralization revealed that the service delivery is improving and there is a need to involve our communities in down-top policy and planning approaches.

2.7 Territory Administrative reform of 2006

The new territorial administration reform carried out at the beginning of the year 2006 is characterized by:

- A new administrative division in which there is Kigali City, *provinces* which moved from 11 to 4; districts and cities which moved from 106 to 30 districts (cities are removed as administrative entities but must rather support the development in the countryside); administrative sectors moved from 1.545 to 416.
- *The district*, as decentralized territorial authority, becomes an entity of planning, development coordination and resource mobilization while *sectors* become entities in charge of "service delivery". The province on the other hand is reduced to a simple administrative territorial entity representing the central government and without real power in decision-making or planning.
- Districts and sectors have qualified human resources as follows: in addition to the Mayor, two Vice Mayors and Executive Secretary, each district has at least 6 senior executive Ao for the technical directorates. In parallel, 4 Ao and some A1 officers are allocated in each sector.
- he organizational chart districts provide for 6 units namely: Unit of Human Resources and Administration; Unit of lands, town planning, Habitat and Infrastructures; Unit of Planning, economic Development and Employment Promotion; Tax Collection Unit ; Unit for Education , Youth, Sports and Culture; Unit for Health, Family Promotion and Protection of Child Rights.

Local Government Authorities under decentralization have direct responsibility for all decentralized services, including natural resources and forests management. With increased local government finance through the Common Development Fund (CDF) and through direct transfers, local authorities have considerable resources to finance their District Development Plans (DDPs) and Performance Contracts (Imihigo). The district authorities will be encouraged to prioritize environmental issues, in their planning and budgets given their dependence on environmental resources and vulnerability to environmental shocks.

In the forest sub-sector, the local government specifically help to:

- Implement the Forestry law;
- Facilitate, support and implement forest policy;
- Facilitate the participation of local communities;
- Liaise with the private sector to facilitate investment;
- Control the land use;
- Support the decentralized forestry extension, and
- Facilitate and control Non-Government Organisation (NGO) interventions in the forestry sector.

2.8 Biomass Energy Strategy (BEST).

As is outlined in the Biomass Energy Strategy of Rwanda (BEST), the value of firewood and charcoal in 2007 was in the order of US $ 122 million, or 5% of GDP. About 50 % of this value remains in rural areas where it is distributed among farmers/wood growers and charcoal producers playing an important role as an engine for rural development.

The Afforestation Support Project (PAREF NL) has put more emphasis on the Biomass Energy Strategy, which is to increase the sustainable supply of wood fuels by:

- increasing efficiency planning of wood fuel supply management activities (Result 1)
- better management and exploitation of State and District biomass energy plantations (Result 2 and 3)
- professionalizing the charcoal value chain (Result 3)

During the implementation of the project activities, the project management unit has introduced continued exchanges with different actors involved in biomass energy production (e.g. MININFRA , IFDC/SEW and CARE International.

3 PROGRESS ACHIEVED

3.1 Assessment of Achievements against Results

Result	OVIs	Progress as per 31st 2013
1. Institutional capacities at the decentralized level regarding afforestation and management of forestry resources are reinforced	Achievement rate for reforestation objectives of the project is more than **90%** in the 9 districts at the end of the project.	**Achieved**: Based on the original method of plantation measurement (1 hectare = 1600 plants) the project achieved **10,524 ha**. In February 2012 the project launched an intensive mapping campaign, involving District DFOs, Operators and GIS specialists, in order to measure all **1,525** PAREF Nl sites. 1,424 sites were GPS measured and corrected for slopes. 101 sites in Nyamasheke are not yet measured. The total GPS project area achieved is **9,422 ha or 94%** (non-measured sites estimated at 585 ha are included in this figure)
	Number of staff trained in districts in implementing biomass energy plantations operations management and the application of relevant rules and regulation regarding decentralized forest management.	**Partly achieved**: Several training/capacity building exercises on sustainable forest management where held for **all project and district DFO staff**. The topics where tree measurement, forest inventory and stand management, exploitation, and decentralized forest management. The training sessions where attended by project field staff, department DFOs from all 9 districts and representatives from DFNC HQ. The project obtained the soft copies of the DFMPs for PAREF NL districts in May 2012. A first assessment of their accuracy was not satisfactory. In order to use them, let alone train district authorities, it was important that the national mapping update and PAREF NL area measurement and control was finalized. As this happened by September 2012, there was not be time to implement this sub activity. As the forest law and rules/regulations to base the guide on, are not yet approved and/or developed, related training and development of training material (modules, guides) could not be implemented by the project.
	Updated situation of forestry assets of the 9 districts available.	**Mostly achieved:** All district and sector maps regarding Forest cover are updated by using 2008-10 ortho photos. The final report was produced and validated. The control mission was carried out and the final report of the C-GIS was approved in February 2013. Two sets of maps (902 maps) and 10 maps of Rwanda forest cover were printed (Rwanda, Provinces, Districts and Sectors) in March. All data was put on a DVD (Maps in PDF, Maps for Web mapping and GIS data). For Western province the forest cover (without lakes and including shrub land) is **146,157 ha or 30.01** %. For the 2 Northern provinces Burera and Musanze the forest cover (without lakes and including shrub land) it is **23,169 ha or 21 %.** The average for the whole project are is about 24.26%. These figures are without the established PAREF plantations. **Adding would increase the average cover for the project area with 1.34 % to 25.6%.**

Result	OVIs	Progress as per 31st 2013
1. Institutional capacities at the decentralized level regarding afforestation and management of forestry resources are reinforced	The management tools to manage the created biomass energy plantations are available	**Not achieved:** The project obtained the softcopies of the DFMPs for PAREF NL districts in May 2012. A first assessment of their accuracy was not satisfactory. In order to use them, let alone develop management tools for them, they first have to be refined and updated. It is important that the national mapping update and PAREF NL area measurement and control is finalized. As this was realized by end 2012, there was time to develop tools. Furthermore the PAREF Be-2 inventory is needed and a cadaster regarding boundaries of different types of forest land (e.g. public, private, district etc) As the forest law and rules/regulations to base the guide on, were not yet approved and/or developed by Rwanda, related management tools could not be developed.
	A framework of operational dialog regrouping in a regular way stakeholders in the forestry sector at the district level (JAF, joint forest action)	**Achieved:** JAF meetings were held regularly in all project districts**.** The project actively supported the forest dialog in the districts, by supporting JAF meetings (funding through district accounts), attending JAF meetings by project staff and supporting of community planting days (Umuganda)

Result	OVIs	Progress as per 31st 2013
2. The forest resources in 9 districts (7 in western and 2 in northern province) are increased and diversified and their management improved	10.000 hectare of reforestation for the production of wood energy.	**Achieved**: Based on original method of plantation measurement (1 hectare = 1600 plants) the project achieved **10,524 ha**. The project launched in 2012 an intensive mapping campaign, involving District DFOs, Operators and GIS specialists, in order to measure all PAREF Nl sites. All sites were GPS measured and corrected for slopes. The total GPS project area achieved is **9,422 ha.** The difference of about 1,100 ha is due to the fact that in some areas planting distances were less than 2.5*2.5 m, thus increasing the number of plants per ha GPS measured.
	Success rate of plantations at the end of project ≥ 80%	**Achieved**: Based on control missions by the project management and GPS crews. The success rate of all plantation visited was well above 80 %. The technical part of the specific audit for Nyamasheke and Rusizi put the rate in these districts well above 90%. (RUMA 2012)
	Number of recorded operators, trained, contracted for implementation, maintenance and management of biomass plantations	**Completed**: A total of 4 operator contracts were signed and their staff was trained. For 3 of the operators the contracts were assessed positively (ACD, EMS and Turwayubukene) and the final 15 % paid in full. For the 4th contractor (Karongi, Rutsiro) ASSEPAGEL, the project withheld 7 % of the final payment as prescribed planting distances were not followed in quiet a number of planting sites.

Result	OVIs	Progress as per 31st 2013
3. A better valorisation of forest products is assured	Number of organized and supported groups of charcoal makers	**Achieved:** A census was held in all 9 project districts. A total of 3 cooperatives, 8 associations and 129 teams with a total of 1,364 members and 1,476 individual charcoal makers were identified and a database established. 90 charcoal makers (including 3 women) were organized in 9 groups, 1 per district. Each group received organizational (cooperative management) and material support.
	Number of trained charcoal makers in improved carbonization techniques	**Achieved:** 90 charcoal makers (10 per district) trained in improved carbonization techniques and proper exploitation techniques
	Percentage of acceptance by charcoal makers of the Casamance kiln at the level of the 9 districts	**Achieved**: According to the impression of trainees, the use of a more modern carbonization technique has doubled the quantity of charcoal, much improved the quality of charcoal produced, the carbonization process time has been reduced by 2 and pollution drastically reduced. The trainees also observed the recovery of creosote water and tar, which has an added value and can be sold and used as treatment of timber. Acceptance to use the kiln was 100%. However further follow up in the years to come will tell how many of them will continue to use the kiln

3.2 Assumption monitoring

	Assumption	Validity & Risk level to project success	Comments
Specific objective	The state land intended to have forests is maintained	**Not valid**. Project has successfully planted on state land	
	A forest cadaster is created	**Still valid**. District management plans could not be updated due to lack of forest cadaster	
	The demand of woody Biomass for fuel is controlled	**Still valid**. Value chain study planned in result 3 has not been implemented by the project	PAREF Be2 has implemented the study, but there is still no control mechanism and proper statistics collection
	Rules and regulations regarding decentralized forest management and tax system are implemented	**Still valid.** Lack of regulations has prevented the development of decentralized forest management	The project prepared a TFF for phase 2, in order to experiment with PFM on woody biomass plantations and developing rules, regulation and tax system proposals
Result 1	Local Governments shall be given competent staff in line with national planning (i.e. DFOs)	**Partly valid**. Sufficient competent staff was not provided at the start of the project	The project provided DFOs. During the project implementation, the department hired DFOs. The project improved the competency through regular training. One DFO per district is however insufficient for the task at hand
	Actors are mobilized and take active part in the consultation framework (JAF)	**Partly valid**. JAF meetings took place with support of project	As financial and logistical support of the project stops, there is a risk that the JAF will become less effective
	The staff is trained and maintained in place	**Partly valid**. Staff is in place and	Only the DFO is in place. In order to have a proper management, more staff (e.g. sector level extensionists(are needed)
Result 2	Operationalization of the forest tree seed center for seed supply.	**Still valid.** Bad seed quality of CGF increased nursery costs and decreased plant quality	Despite inputs from PAREF Be-1, the CGF is still in bad shape and does to date not produce the quality seeds needed.
	Availability of operators specialized in reforestation.	**Not Valid**. Specialized operators are available.	The 4 operators hired by the project performed very well (3) to reasonably well (1)
	The roles of different actors (institutional and wood value chain) are well defined	**Still Valid**. Roles are not clearly defined.	Though DFOs are now under District control. The roles of DFNC, District etc. are not well defined. These should be defined in Law/rules and regulations
Result 3	Forestry taxation system is clearly embedded in the new forestry law and provides incentives to accept improved carbonization techniques	**Still Valid**. Forest law is not yet approved	

3.3 Major achievements

3.3.1 Updated forest cover (Result 1)

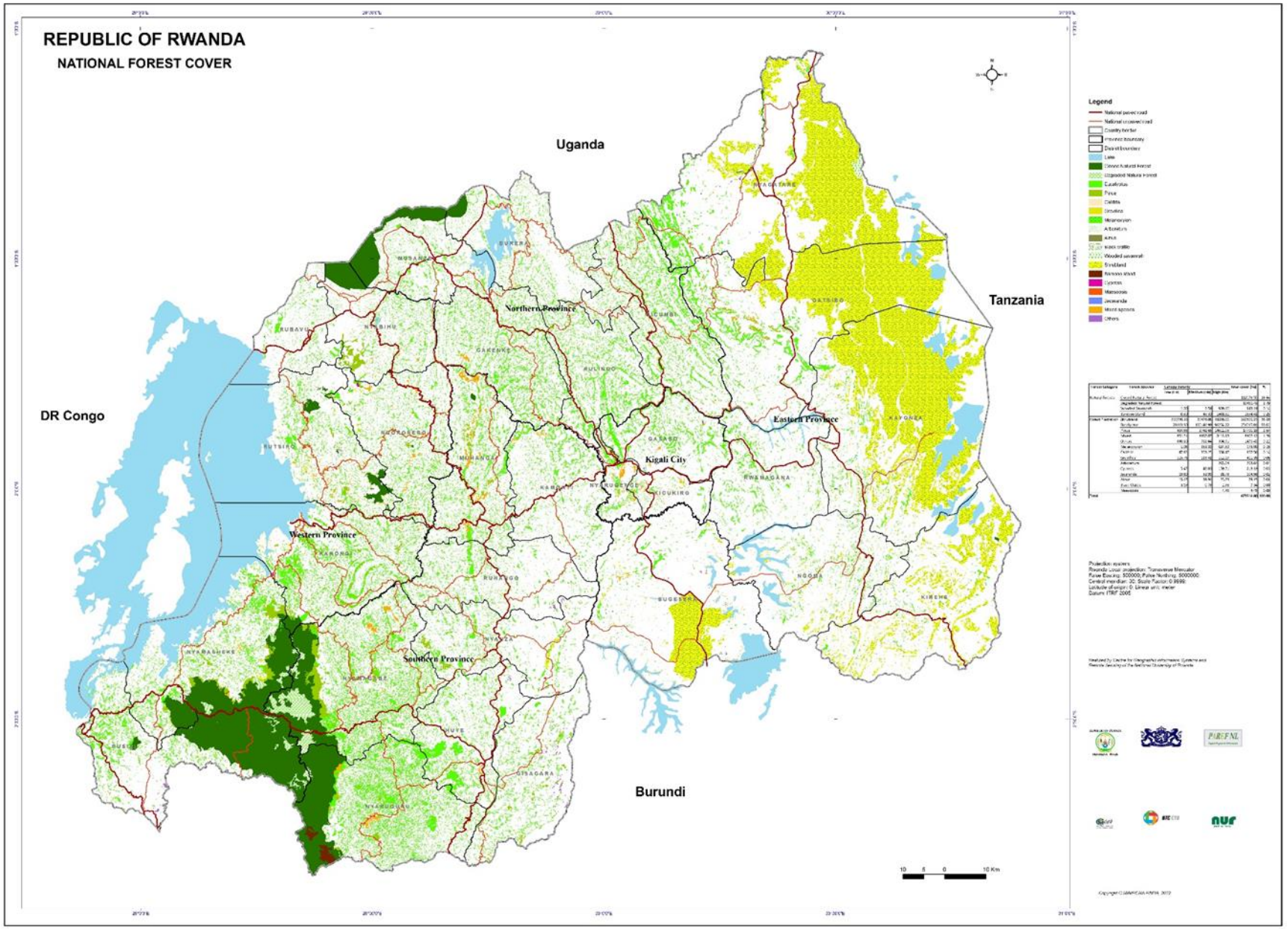
The national forest inventory carried out in 2007 by ISAR and CGIS-NUR considered only forest areas with 0.5 ha or more due to relatively low resolution of satellite images used [Landsat (30 m), Aster (15m) and SPOT (10-20m)] and financial limitations (MINIRENA/CGIS-NUR, 2007). This national forest cover inventory was therefore incomplete because it left out smaller woodlots (< 0.5 ha), while such woodlots are considered the main source of forest products for rural and even urban households needs.

In fact, a recent study by FAO (FAO, 2010) estimated that small woodlots and tree resources outside forest (TROF) cover around 6.6% of Rwanda land area. It was anticipated that the forest mapping update exercise, which included smaller forest plantations up to a quarter of a hectare (0.25 ha), would provide more reliable data on smaller forest plantations and hence constitute a reliable source for future planning of the forest sector.

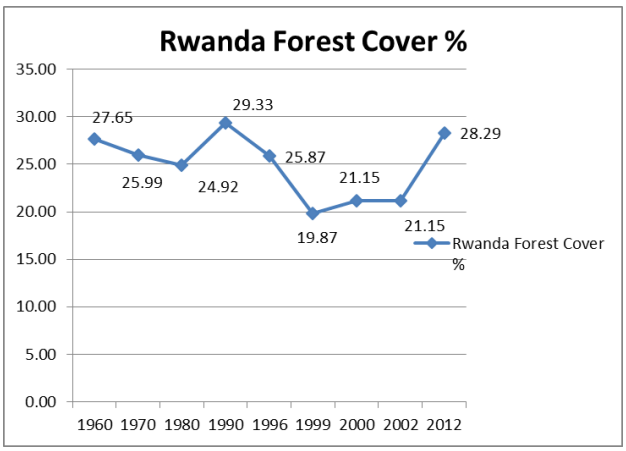
The C-GIS carried out a Forest cover mapping update by using 2008-10 ortho-photos. The final report was produced and validated in 2012. The control mission was carried out and the final report of the C-GIS was approved in February 2013. The major cover findings were show in the table 4. The updated Rwanda Forest Cover map is shown in **Annex 2**.

Forest category	Forest species	Forest canopy density			Total cover (ha)	%
		Low (ha)	Medium (ha)	High (ha)		
Natural forest	Closed Natural Forest	**(>=50%)** 112,076.55			112,076.55	16.64
	Degraded Natural Forest	(**<50%)** 11,461.46			11,461.46	1.70
	Wooded Savannah	1.00	2.59	939.60	943.19	0.14
	Bamboo Stand	0.30	45.30	1608.81	1654.41	0.25
	Shrubland	200,770.19	31,478.08	28,320.96	260,569.23	38.69
Forest plantation	Eucalyptus	29,663.80	130,146.99	96,254.22	256,065.01	38.02
	Pinus	434.55	2,742.65	14,612.95	17,790.15	2.64
	Callitris	47.83	353.25	556.47	957.56	0.14
	Cypress	5.47	48.00	159.71	213.19	0.03
	Grevillea	115.76	183.41	112.19	411.36	0.06
	Jacaranda	19.80	52.99	31.78	104.58	0.02
	Alnus	15.47	38.94	23.73	78.15	0.01
	Black wattle	3.59	0.79	2.96	7.34	0.00
	Melanoxylon	1.05	353.39	624.52	978.96	0.15
	Maesopsis			4.45	4.45	0.00
	Arboretum			263.64	263.64	0.04
	Mixed	851.31	4,497.87	3,112.93	8,462.12	1.26
	Others	330.30	788.64	356.51	1,475.45	0.22
TOTAL					**673,516.80**	**100.00**

Table 4 Rwanda Forest Cover 2012


REPUBLIC OF RWANDA
NATIONAL FOREST COVER
Uganda
Tanzania
DR Congo
Burundi
Northern Province
Eastern Province
Western Province
Southern Province
Kigali City
Legend

Two sets of maps (902 maps) and 10 maps of Rwanda forest cover were printed (Rwanda, Provinces, Districts and Sectors) in March 2013. All data were put on a DVD (Maps in PDF, Maps for Web mapping and GIS data) for wider dissemination

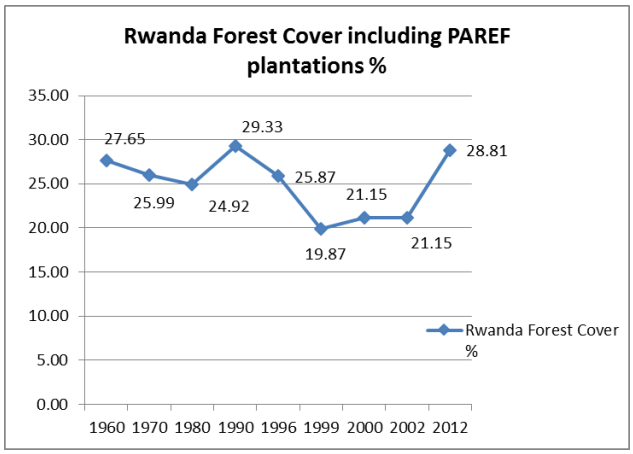


Based on the update of the national forest cover, it is currently accepted that the national forest cover is approximately 673,516 ha or about 28.29 % of the country with a large proportion of shrub lands and badly managed plantations.

This figures are based national land area, excluding lakes and including all areas up to 0.25 ha. The chart left shows the development of the forest cover over the period 1960 to 2012.

However the chart above does not show the results of PAREF Be1 (**2,923 ha**) and PAREF NL 1(**9,422 ha**). If the established biomass plantations are added to, the forest cover increases 0.52 % up to **28.81 %.**

The chart above is based on forest areas bigger or equal than 0.25 ha (2,500 m²). Therefor it does not include smaller patches of cover and individual trees. Based on the November 2012 SDA or Supply Master plan for Fuel wood and Charcoal of Kigali study (which was updated with the results of the 2012 Forest Cover) it is estimated that 5.2 % of land cover (TOF = Trees Outside Forests) was taken by agroforestry plots (< 0.25 ha) and individual trees.



This 5.2 % is not part of the 28.81% forest cover. Even if only half of the 5.2 % is added the forest cover is already well above the 30% level of the Vision 2020 objective. Adding the full 5.2 % will give a **cover of 34 %.** Reaching and even surpassing the 30 % indicator of Vision 2020 would mean a huge achievement of the RNRA and the Forest Department. It calls for a change in strategy, towards improvement of (participative) forest management and increase of biomass productivity per ha from 9.6 m³/ha (CPS) = Current Productivity Scenario) to 15 m³/ha (MPS=Managed Productivity Scenario) or more.

3.3.2 Established biomass energy plantations (Result 2)

The method of plantation measurement in the Technical and Financial file was based on the number of trees per ha. For every 1,600 plants, 1 hectare was established. Based on this method and M&E approved operator reports, the project achieved **10,524 ha**. This method of 1,600 trees per hectare, is based on a planting distance of 2.5*2.5 meter. If the planting distance changes with 10 cm (planting distance 2.4*2.4 m), it means 1,736 plants are planted, resulting in 1.09 hectare. A spacing of 2*2 meter would result in 2,500 plants or 1.56 ha. Expressing the number of hectares using this method does give a distorted view of the real number of hectare, measured by GPS and corrected for slope.

In 2012 the project launched an intensive mapping campaign, involving District DFOs, Operators and GIS specialists, in order to measure all PAREF Nl sites. More than **1,424** sites were GPS measured and corrected for slopes. In Nyamasheke **101** sites with an estimated surface of **586** ha have not yet been measured, due to lack of time and wet weather. It is proposed to measure them during the proposed phase 2.

Almost all PAREF Nl plantations have been mapped and GIS data cleaned. This means they can be combined with the GIS data from the Rwanda forest cover update exercise. A3 Maps were produced with excel tables, showing details of all sites. These were attached as annexes to the District plantation handing over documents. By 15 May 2013 all handing over documents were signed by the Districts. The total GPS measured project area achieved is **9,422 ha (measured 8,836, still to be measured 586)**

Note: All documents are now with DDG to be forwarded to DG for signing after final approval from PS MINIRENA.

District	Objectives TFF			Achieved											
	Ha	Zone (ha)	%	Full plantation (ha)	GPS (ha)	Road, Lake & River side (ha)	GPS (ha)	Conversion (ha)	GPS (ha)	Total (ha)	Total GPS (ha)	Total (ha) per zone	% (Plants)	Total GPS (ha) per zone	% (GPS)
Burera	1,500	2,000	15%	485	412	728	637	0	0	1,213	1,049	1,743	87%	1,598	80%
Musanze	500		5%	195	147	326	392	9	9	530	548				
Nyabihu	300	1,800	3%	610	567	38	38	60	59	709	664	2,348	130%	2,219	123%
Rubavu	1,000		10%	547	517	60	59	0	0	606	576				
Ngororero	500		5%	1,012	958	0	0	21	21	1,033	978				
Karongi	1,000	3,000	10%	585	453	406	325	0	0	991	778	2,489	83%	1,778	59%
Rutsiro	2,000		20%	1,023	655	476	345	0	0	1,499	1,000				
Rusizi	1,000	3,200	10%	898	884	909	909	35	32	1,842	1,826	3,943	123%	3,827	120%
Nyamasheke	2,200		22%	1,228	1,156	859	836	13	9	2,101	2,001				
Total	**10,000**		**100%**	**6,582**	**5,749**	**3,803**	**3,543**	**138**	**130**	**10,524**	**9,422**		**105%**		**94%**

Table 1 detail of established plantations per District and zone

Most of the Districts achieved their targets. Zone 2 and 4 surpassed their targets with 23 to 30%. Karongi and Rutsiro under-performed, due to the fact that the planting distances used were 2.2*2.2 to 2.3*2.3 meter, effectively increasing the number of plants per hectare to around 2,000.

As the plantation established are for biomass energy production and not for timber, there more plants per hectare will increase the productivity per hectare.

The original planting distance of 2.5*2.5 meter is for biomass energy plantations (certainly where soils in the west of Rwanda are good and rainfall is abundant) is on the high site and should be about 2*2 meter, to increase biomass productivity.

Based on the total cost made via district accounts and operator cost (including extra labour for Gishwati protection up to 31 March 2013) and average cost per ha for supervision and BTC overhead (MTR), the total cost for the establishment of 9,420 ha were 8,992,783 Euro, or 954 Euro per hectare. See table 2

Cost	Description	Total cost		Average cost /ha	
		RWF	EURO	RWF	EURO
Direct cost	labour and plant related cost	4,542,532,058	5,678,165	482,143	603
	Operators	797,747,088	997,184	84,673	106
Total direct cost		5,340,279,146	6,675,349	566,815	709
Supervision	DFOs, Zone supervision, others			46,858	61
Overhead BTC	Directorate and BTC			147,991	185
Total Costs				761,664	954

Table 2 Average cost per hectare in RWF and Euro

This cost per hectare of 954 euro is about the same as found by the MTR mission and stands at normal levels, underlining a good project efficiency.

The project opted to use the High Intensity Labour method and payment through Districts to establish plantations. Table 3 shows direct average production cost per hectare per district. The cost per District varies between 384 and 873 euros. This is mostly due to cost for transport distances and a lot of small isolated plots. The higher cost in Karongi and Rutsiro per hectare is due to the fact that planting distances used were in the order of 2.2*2.2 to 2.3*2.3 meter, increasing cost per hectare GPS measured.

District	Labour and plant production		District Supervision		Plant transport		Total		Ha	Cost/ha (€)
	RWF	EURO	RWF	EURO	RWF	EURO	RWF	EURO		
Musanze	216,846,371	271,058	6,422,998	8,029	14,957,535	18,697	238,226,904	297,784	548	543
Burera	305,675,520	382,094	6,326,109	7,908	10,406,091	13,008	322,407,720	403,010	1,049	384
Nyabihu	248,147,910	310,185	2,839,900	3,550	1,324,000	1,655	249,789,510	312,237	664	470
Rubavu	304,464,142	380,580	9,096,774	11,371	6,110,997	7,639	317,296,613	396,621	576	688
Ngororero	346,484,930	433,106	9,858,305	12,323		0	353,772,935	442,216	978	452
Karongi	529,761,514	662,202	13,361,953	16,702	572,160	715	543,695,627	679,620	778	873
Rutsiro	654,135,882	817,670	4,838,678	6,048		0	658,974,560	823,718	1,000	824
Rusizi	801,930,990	1,002,414	9,861,158	12,326	6,360,000	7,950	818,152,148	1,022,690	1,826	560
Nyamasheke	1,031,543,241	1,289,429	11,198,970	13,999	1,652,000	2,065	1,040,216,041	1,300,270	2,001	650
Total	**4,438,990,500**	**5,548,738**	**73,804,845**	**92,256**	**41,382,783**	**51,728**	**4,542,532,058**	**5,678,165**	**9,422**	**603**

Table 3 Direct average production cost per hectare per District

3.3.3 Organization and Training of Charcoal makers (Result 3)

In order to identify charcoal burners in the project area a census was conducted and 3,123 charcoal burners were identified. Results are shown in Table 3.

Charcoal is still produced from fuel wood with a limited yield (7-10 %) due to traditional low performing techniques of carbonization. The main reason mentioned during the census was lack of sufficient knowledge regarding improved carbonization techniques. The traditional methods produce huge losses due to partly carbonized wood, a low yield in quantity, low quality and short processing time, especially during the rainy season

Distirct	No Cooperatives	Total Members	No Associations	Total Members	No of Teams	Total Members	No of individual charcoal makers	Total No of charcoal makers	%	Total No of organizations	%
Burera	3	47			5	58	232	337	10.79%	8	5.71%
Musanze			1	57	20	148	163	368	11.78%	21	15.00%
Nyabihu					6	91	153	244	7.81%	6	4.29%
Rubavu							146	146	4.67%	0	0.00%
Ngororero			1	30	26	162	136	328	10.50%	27	19.29%
Karongi					12	70	155	225	7.20%	12	8.57%
Rutsiro			3	61	7	49	180	290	9.29%	10	7.14%
Rusizi			1	32	8	54	148	234	7.49%	9	6.43%
Nyamasheke			2	56	45	732	163	951	30.45%	47	33.57%
No of organizations	3		8		129					140	
No of members/org		47		236		1364	1476	3123			
Percentage	2.14%	1.50%	5.71%	7.56%	92.14%	43.68%	47.26%				

Table 4 Summary of charcoal burners per district and category.

Organization wise, the census showed that there are only 3 cooperatives with a total of 47 members (1.5 % of all charcoal burners, which are all located in Burera. The project area contains 8 associations with a total of 237 members (7.56%). The number of teams is important: 129 teams with a total of 1,364 members (43.68%) exist in the project area. Still more than 1,476 charcoal makers (47.26 %) are not organized. The district with the highest number of charcoal makers is Nyamasheke (951) and Rubavu the lowest (146).

After the field census, 10 charcoal burners were shortlisted from each PAREF Nl district to be trained in improved charcoal production techniques, exploitation techniques and cooperative management. In total 90 charcoal burners from the project area were trained. Each organization received proper equipment to implements improved carbonization.

During the four carbonization training sessions the trainees witnessed an increase in charcoal production per quantity of wood used compared to their yields using traditional method. The average mass yield was 17 %. As the wood used was not well dried, the mass yield could have been bigger.

According the impression of trainees, the use of a more modern carbonization technique has doubled the quantity of charcoal, much improved the quality of charcoal produced, the carbonization process time has been reduced by 2 and pollution drastically reduced. The trainees also observed the recovery of creosote water and tar, which has an added value and can be sold and used as treatment of timber. Table 4 shows productivity figures obtained during training sessions

Carbonization site	Kiln Type	No of steres carbonized	No of Kg	Carbonization days	Yield (no of bags)	Average weight per bag	Yield in Kg	Mass yield	Wood non carbonized in kg	other losses	Spp. comments	recovered creosote (jerrycans)
Ruzisi	Rectangular	8	4,938	4	15.5	38	593	0.12	58		E. saligna	1
Ruzisi	Casamance	16	9,890	5	33	38	1,259	0.13	102.5		E. saligna	5
Kora	Rectangular	8	4,800	6	15	55	825	0.17	0	fire, 5 bags lost	Carbonized wood was stil wet	3
Byangabo	Rectangular	8	4,650	9	17	57	969	0.21	150		E. maidenii	3
Byangabo	Casamance	7	4,040	6	14	53	742	0.18	160		E. maidenii	4
Karongi	Rectangular	4.75	2,520	5	11	51	561	0.22	330		E. teretocornis	3
Karongi	Casamance	8	4,344	6	16	49	784	0.18	456		E. teretocornis	3
Average								**0.17**				

Table 5 Overview of productivity by using improved carbonization kiln during the training

3.3.4 Environmental Impact

Several missions were carried out in the different partner districts between November 2012 and March 2013 in order to evaluate the social-economic and environmental impacts of the project PAREF.Nl. The M&E team visited the 9 districts and had the opportunity to talk with the local authorities, the local population and leaders of the financial institutions responsible for payment of labor employed by PAREF.Nl.

The 9 districts agreed on the positive effects of the project in the fight against erosion, thereby limiting landslides and floods. Most of the districts have a hilly topography with steep slopes which have to be protected from erosion. The project has helped to protect these hillsides 5,887 ha as well as road/lakesides 3,803 ha.

A large part of the Gishwati mountain forest, which was completely degraded after war of 1994, has been replanted with the contribution of the PAREF.Nl, leading nowadays to a better situation in terms of floods and erosion.

3.3.5 Economic aspects

By implementing the labor intensive approach, the project provided employment to many people, more specifically to the most "vulnerable" class. A total of more 4 million work days @ 900 RWF/day, or more than 3.6 billion RWF have been paid to local workers employed by PAREF Nl. The percentage of women was about 45 %. This job creation has contributed to the poverty alleviation in those districts.

The project helped to fund some local microfinance institutions by creating new members with their own account. Each member of a SACCO ("Savings and Credit Cooperative") paid the membership fees (about 5000 RWF), account opening fees (about 2000 RWF) and levy on salary (about 500 RWF), differing from one institution to another.

The collaboration between the project and the local financial institutions allowed people to access the bank system and to become familiar with it. Most of the people employed by PAREF.Nl didn't own an account previously. The project helped them to gain confidence in the bank system so that they could continue to use their account in the future. Generally, no savings were observed for PAREF.Nl workers but some credits were granted.

The monetary injections performed by the project at the district level are significant. Approximately 9,422 ha of area was planted by PAREF.Nl. Over the next years, each district will be able to collect considerable income related to the exploitation of those plantations. In addition to the wood which will be harvested after 4-7 years, the district also benefits from revenues related to transport licenses (ca. 2000 RWF) and taxes and cutting permits (ca. 2000 RWF) directly linked to the exploitation of the forest plantations. The price of licenses slightly vary depending on the district considered.

3.3.6 Social aspects

The two most disadvantaged socio-economic classes were targeted by the recruitment processes of the project (there are 6 socio-economic classes defined at the village level based on the possession of property).

The local labor pointed out the social impact of the project which has helped them to get on well together and maintain good relations between villagers and with neighboring villages (some relationships (couples) during the project planting campaigns emerged). Misunderstandings between families are less frequent than before.

The project enabled the local population employed to get a job near their families whereas they usually had to move to another region to find work.

Local labor learned different techniques of planting trees and nurseries. Some practical trainings were given to local people such as "charcoal making". The charcoal makers agree on the better operating conditions and increased yield through improved carbonization techniques.

The salaries paid by PAREF.Nl to the local labor enabled them to improve their standard of living (school fees, electricity, mutual health, clothes, house, etc.). Some of them invested in cattle, land or tree planting (using techniques learned through the project).

Many women were employed by PAREF.Nl (about 45 %), providing them some independence from their husbands.

The plantation guards met some difficulties to face the livestock farmers (who do not accept the ban on grazing). Some of them were beaten by those farmers. This was especially the case in Gishwati.

The local labor complained about insufficient salaries (900 RWF). The salaries paid by PAREF.Nl were in some districts lower than those paid by other projects acting in the same region.

4 CHALLENGES, ISSUES AND OPPORTUNITIES

4.1 Challenges and Issues

- The major challenge faced by the project was the relatively short period in which activities, especially 10,000 of afforestation had to be done. As the project is carried out in co-management start-up procedures are taking longer than usual (long public tendering for almost all activities). This in combination with the fact that afforestation is a seasonal process and has a limited window of opportunity during the year. If nurseries cannot be established in time, a whole planting season of 1 year (project year) can be lost. This happened to PAREF Nl and first major plantations were done in 2010/11;
- Once all necessary elements for afforestation are in place (trained staff, district conventions, operator contracts etc.), establishment of biomass energy plantations gains pace. Unfortunately a project normally has to be closed at the moment were all elements are in place and functioning well, causing the system to halt and momentum is lost;
- The project documents lacked a proper handing strategy over of biomass energy plantations. Notwithstanding the fact that the project planned for financial support from districts, so they that they would be able to take over protection and maintenance for at least a year. This project proposal was not taken into account during fiscal year planning;

- Due to the fact that existing DFMPs were below expected quality, the forest law not yet approved and rules and regulations thus not developed, the projects' objectives in terms of management systems development for biomass energy plantations and participatory forest management training were under expectations;
- Shortage of public lands in some districts like Musanze and Burera has been a big challenge regarding realization of the planned biomass energy plantation area. On other hand, the project was confronted with a lot of very small sites and long transport distances to reach them. This consumed a lot of time and money during the sites identification, preparation and tree planting activities;
- Long procedures and district staff who are very busy with district obligations hampered timely payment of labor in some districts, causing problems for the project in hiring staff;
- The districts signed a convention with the Ministry of Natural Resources and BTC which convention obliged districts to provide technical and financial reports on regularly basis. During the implementation, the project had to invest considerable time to avoid delay in technical and financial reporting by district technicians which affected the proper monitoring of project operations;
- Destruction of young plantations by animals especially in Gishwati area and sites approaching the Volcanoes National Park in Musanze district obliged the project to put a lot of emphasis on protection. Also the trees planted along roadsides and lakesides have suffered from the activities of agriculture and livestock in the majority of districts of the intervention zone of the project;
- The short execution period of the project has forced the project to abandon young plantations before becoming at a stage were protection and maintenance is no longer necessary. This concerned especially the trees planted in the last season from October to December 2012;
- The project also faced the issue of a lack of seed quality from seeds delivered by CGF, notwithstanding the fact that during PAREF Be-1 a lot of support was given to the center. Throughout the project implementation period bad quality seed remained a problem and has caused a lot of extra work by nursery staff (bad germination rate) and plant growth (bad seedling form);
- The project faced a big challenge regarding project audits. During its life span the project had 4 external audits, 5 Districts audits and 1 audit from the audit general (2 fiscal years at once). Beside the fact that audits are not cheap the cost the staff a lot of extra time and caused a lot of anxiety, negatively influencing project effectiveness.
- The institutional embedding of the project was very weak. This was mainly due to constant changes in the department settings and lack of a large number of properly trained staff for several positions. This is also negatively effects project results/outputs as the project is perceived as something outside the department, like an operator that cannot be fully trusted and thus not owned.

4.2 Opportunities

4.2.1 Changing long term forest strategies

Extending a project forestry life span up to 6 years or more (in line with first biomass energy plantation rotation) would considerably improve the output in terms of output, cost-effectiveness and durability.

Based on the findings of the forest cover update, PAREF biomass energy establishment and assumption that at least 5.2 % of cover (patches smaller than 0.25 ha and individual trees) is not included in the updated cover of 28.81%, one can conclude that the visions 2020 target of 30 % has been met. This creates an opportunity to shift from the forest cover strategy towards a forest management and productivity improvement strategy for the Rwanda forest Sector.

4.2.2 Participatory Forest Management

Neither forestry law nor other instructions which should serve as safeguards for proper forest management are respected, nor rigorously applied. Furthermore, the revised forest law is not yet approved by Parliament and no proper rules and regulation for forest management have been developed. Though District forest management plans were developed during 2008-2010, they are not used by the district, as no money for investment is allotted for forest management and not enough well trained staff is available to carry out the plans.

Experimenting with participatory forest management through identified, organized and active cooperatives or associations could be an opportunity to come to sustainable forest management and protection of the public forest plantations, and ensure stable income (through benefit sharing between cooperatives, districts and RNRA/DFNC. For the participatory management by cooperatives and associations the government could give priority to those consisting of women and youth.

Development of proper mechanism for the sharing of benefits coming from the participatory managed biomass energy plantations will help local population to earn money from forest activities and the whole sector will benefit from those forests well managed and that give high biomass energy production. Showing that forest management contributes considerably to the GDP, could convince Rwandan policy makers that investing in biomass energy is a profitable undertaking.

4.2.3 The way forward. What to do with 9,422 ha

Table 6 and 7 on the following page show simulations of possible harvesting revenues after 4 and 7 year rotations. Under the CPS (Current Productivity Scenario) with mean annual increment of 9.6 m^3/ha/year), brut revenue at the end of first 4 year rotation would be € 4,653,798, based on 25 % production for charcoal and 75% for fire wood. For a 7 year rotation this would be about € 8,144.147 almost reaching a break even on investment per hectare (project investment =9,422*954€ = € 8,988,588) Even with this very low productivity rate, break-even will be during the 2nd seven year rotation (without taking into account accumulated interest).

When management of plantations is approved (MPS or Managed Productivity Scenario) and productivity is increased to 15 m^3/ha/year, the figures increase with about 45% to €7,271,554 (4 year rotation) and € 12,725,229 (7 year rotation). Based on 4 rotational periods of 7 years, a total brut revenue could be reached of € 50,901,196 after 28 years. A production up to 23 m3/ha/year is feasible on good soils and abundant rainfall and has already been achieved in Rwanda under field conditions. Brut revenue for a first 7 year rotation would be € 19,512,018 or 10,530,328 (minus PAREF initial investments), creating a brut profit of € 160/ha. Under controlled conditions in Butare arboretum a production of 30 m3/ha/year has been achieved. With good management this is achievable in the field.

Estimation of revenu from de harvesting of biomass energy plantations established under PAREF Nl-1 from year 4 and 7 (Current Productivity Scenario)																4 year rotation			7 year rotation		
District	Ha planted by PAREF.nl (GPS)	Mean annual increment (m^3/ha/yr) 1)	Mean annual wood production (m^3/yr)	Form factor	Mean annual wood production (stères/yr)	Average stère weight (kg)	Mean annual wood production (ton/yr)	Yearly quantity of commercial wood in form of charcoal (ton/yr)	Yearly charcoal production (ton/yr)	Yearly fire wood production (ton/yr)	Yearly production of fire wood (stères/yr)	Average price of a bag of charcoal (RWF)	Average cost of a stere of wood (RWF)	Annual revenu from the sale of charcoal (RWF)	Annual revenu from sale of fire wood (RWF)	Revenu from the sale of Charcoal	Revenu form the sale of firewood	Total Revenu	Revenu from the sale of Charcoal end 7 year rotation	Revenu form the sale of firewood	Total Revenu
								75% of wood production	*20 % return of mass*	*25% of wood production*	*Form factor = 0,7*	*Bag of charcoal = 33kg*									
Musanze	548	9.6	5,261	0.7	7,515	455	3,420	2,565	513	855	1,221	3130	4500	48,650,444	5,495,657	€243,252	€27,478	€270,731	€ 425,691	€ 48,087	€ 473,778
Burera	1,049	9.6	10,070	0.7	14,386	455	6,546	4,909	982	1,636	2,338	3130	4500	93,128,313	10,519,971	€465,642	€52,600	€518,241	€ 814,873	€ 92,050	€ 906,922
Nyabihu	664	9.6	6,374	0.7	9,106	455	4,143	3,108	622	1,036	1,480	3130	4500	58,948,713	6,658,971	€294,744	€33,295	€328,038	€ 515,801	€ 58,266	€ 574,067
Rubavu	576	9.6	5,530	0.7	7,899	455	3,594	2,696	539	899	1,284	3130	4500	51,136,233	5,776,457	€255,681	€28,882	€284,563	€ 447,442	€ 50,544	€ 497,986
Ngororero	978	9.6	9,389	0.7	13,413	455	6,103	4,577	915	1,526	2,180	3130	4500	86,825,062	9,807,943	€434,125	€49,040	€483,165	€ 759,719	€ 85,820	€ 845,539
Karongi	778	9.6	7,469	0.7	10,670	455	4,855	3,641	728	1,214	1,734	3130	4500	69,069,425	7,802,229	€345,347	€39,011	€384,358	€ 604,357	€ 68,270	€ 672,627
Rutsiro	1,000	9.6	9,600	0.7	13,714	455	6,240	4,680	936	1,560	2,229	3130	4500	88,778,182	10,028,571	€443,891	€50,143	€494,034	€ 776,809	€ 87,750	€ 864,559
Nyamasheke	2,001	9.6	19,210	0.7	27,442	455	12,486	9,365	1,873	3,122	4,459	3130	4500	177,645,142	20,067,171	€888,226	€100,336	€988,562	€ 1,554,395	€ 175,588	€ 1,729,983
Rusizi	1,826	9.6	17,530	0.7	25,042	455	11,394	8,546	1,709	2,849	4,069	3130	4500	162,108,960	18,312,171	€810,545	€91,561	€902,106	€ 1,418,453	€ 160,232	€ 1,578,685
Total realised	9,422	9.6	90,432	0.7	129,189	455	58,781	44,086	8,817	14,695	20,993	3130	4500	836,290,473	94,469,143	€4,181,452	€472,346	€4,653,798	€ 7,317,542	€ 826,605	€ 8,144,147

Table 6 Estimation of revenue from harvesting of biomass energy plantations established in PAREF Nl project area (CPS 9.6 m3/ha/yr)

Estimation of revenu from de harvesting of biomass energy plantations established under PAREF Nl-1 from year 4 and 7 (Improved Management Scenario)																4 year rotation			7 year rotation		
District	Ha planted by PAREF.nl (GPS)	Mean annual increment (m^3/ha/yr) 1)	Mean annual wood production (m^3/yr)	Form factor	Mean annual wood production (stères/yr)	Average stère weight (kg)	Mean annual wood production (ton/yr)	Yearly quantity of commercial wood in form of charcoal (ton/yr)	Yearly charcoal production (ton/yr)	Yearly fire wood production (ton/yr)	Yearly production of fire wood (stères/yr)	Average price of a bag of charcoal (RWF)	Average cost of a stere of wood (RWF)	Annual revenu from the sale of charcoal (RWF)	Annual revenu from sale of fire wood (RWF)	Revenu from the sale of Charcoal	Revenu form the sale of firewood	Total Revenu	Revenu from the sale of Charcoal end 7 year rotation	Revenu form the sale of firewood	Total Revenu
								75% of wood production	*20 % return of mass*	*25% of wood production*	*Form factor = 0,7*	*Bag of charcoal = 33kg*									
Musanze	548	15	8,220	0.7	11,743	455	5,343	4,007	801	1,336	1,908	3130	4500	76,016,318	8,586,964	€380,082	€42,935	€423,016	€ 665,143	€ 75,136	€ 740,279
Burera	1,049	15	15,735	0.7	22,479	455	10,228	7,671	1,534	2,557	3,653	3130	4500	145,512,989	16,437,455	€727,565	€82,187	€809,752	€ 1,273,239	€ 143,828	€ 1,417,066
Nyabihu	664	15	9,960	0.7	14,229	455	6,474	4,856	971	1,619	2,312	3130	4500	92,107,364	10,404,643	€460,537	€52,023	€512,560	€ 805,939	€ 91,041	€ 896,980
Rubavu	576	15	8,640	0.7	12,343	455	5,616	4,212	842	1,404	2,006	3130	4500	79,900,364	9,025,714	€399,502	€45,129	€444,630	€ 699,128	€ 78,975	€ 778,103
Ngororero	978	15	14,670	0.7	20,957	455	9,536	7,152	1,430	2,384	3,406	3130	4500	135,664,159	15,324,911	€678,321	€76,625	€754,945	€ 1,187,061	€ 134,093	€ 1,321,154
Karongi	778	15	11,670	0.7	16,671	455	7,586	5,689	1,138	1,896	2,709	3130	4500	107,920,977	12,190,982	€539,605	€60,955	€600,560	€ 944,309	€ 106,671	€ 1,050,980
Rutsiro	1,000	15	15,000	0.7	21,429	455	9,750	7,313	1,463	2,438	3,482	3130	4500	138,715,909	15,669,643	€693,580	€78,348	€771,928	€ 1,213,764	€ 137,109	€ 1,350,874
Nyamasheke	2,001	15	30,015	0.7	42,879	455	19,510	14,632	2,926	4,877	6,968	3130	4500	277,570,534	31,354,955	€1,387,853	€156,775	€1,544,627	€ 2,428,742	€ 274,356	€ 2,703,098
Rusizi	1,826	15	27,390	0.7	39,129	455	17,804	13,353	2,671	4,451	6,358	3130	4500	253,295,250	28,612,768	€1,266,476	€143,064	€1,409,540	€ 2,216,333	€ 250,362	€ 2,466,695
Total realised	9,422	15	141,300	0.7	201,857	455	91,845	68,884	13,777	22,961	32,802	3130	4500	1,306,703,864	147,608,036	€6,533,519	€738,040	€7,271,559	€11,433,659	€1,291,570	€12,725,229

Table 7 Estimation of revenue from harvesting of biomass energy plantations established in PAREF Nl project (MPS 15m^3/ha/yr)

5 LESSONS LEARNED

The HIMO approach is contributing to good quality of plantation (respect of norms) and is contributing to poverty reduction in rural areas: 4.543 billion RWF or 5.678 million Euro paid through bank accounts.

The quality of seeds is very important to achieve high productivity rates. For some species like Alnus melanoxion, Grevillea robusta and Eucalyptus tereticornis better provenances should be sought.

Protection and maintenance of young biomass energy plantations is a must in some areas at least for a period of two years (Gishwati biomass energy plantations and roadside plantations in Musanze and Burera);

There is a need to increase intervention on private lands including agroforestry areas as public lands for afforestation are getting scares. Reforestation of old unproductive plantation is still possible, but requires a higher investment per hectare.

Signing contracts for long term period in order to reinforce maintenance and protection – Multi-annual Contracting of operators is more efficient than annual contracts;

The methods of 1,600 plants planted results in hectare should not be used. Area should be identified and GPS measured before planting.

From identification of an area to be planted a proper plantation log should be kept, indication objective and management method for the area.

Measurement of afforestation sites based on the number of plants planted is not a proper way to measure the number of hectares planted.

Durability strategy of biomass energy projects should be planned for from day 1 and properly described in the TFF

The payment of local labor should be done in accordance with payments deadlines. The payment system of labor should take into account this aspect in order to avoid misunderstandings and loss of confidence from employees. If HIMO approach is used, districts should receive accountant support in order to meet payment deadlines.

The District Forest Office should be properly equipped and DFO provided with transport and support staff. A Forest extensionist per Sector should be in place.

The project should more actively support the capacity building of the various actors involved in the forestry sector. Focus should more be put on trainings and technical support.

6 CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE SUPPORT

In a relatively short period of 3 years PAREF NL has established 9,422 ha of biomass energy plantations (GPS measured) or 10,524 ha (based on 1,600 plants/ha) at a cost of 954 euro/hectare, which is a normal investment rate for plantations and underlines a good project efficiency.

Most of the areas afforested had steep slopes (including the mountain areas of Gishawati) and planting has therefore reduced erosion and thus the frequency of landslides and floods.

The overall execution rate of the project by the end of April was 99.12 %

The project through C-GIS/NUR successfully executed the update of the Rwanda Forest Cover map, which will serve as a basis for the National Forest Inventory carried out by PAREF Be-2 and carried out a census of charcoal makers in the project area, resulting in training and organization of 9 cooperatives of 10 charcoal makers each.

The project has provided employment for many people, most of whom belong to the most "vulnerable" class, contributing to poverty alleviation. They have learned suitable techniques for planting trees and nurseries. They have become familiar with financial institutions such as SACCO ("Savings and Credits Cooperatives") and popular bank.

Monetary injections of the project in rural areas, in financial institutions and districts were significant and noticeable. In addition to upcoming revenues related to the harvesting of trees, the district will earn incomes from the different licenses (transport and operating licenses).

The project has employed many local workers, including many women. It has helped people to meet and to get on well together. It has enhanced the exchanges/trade between neighbouring villages. Women were helped to acquire some social and financial independence.

All in all it can be concluded that the project was very successful, thanks to active involvement of Districts, MINIRENA, RNRA/DFNC, operators, a dedicated project team and of course thousands of labourers without whom the biomass energy plantations would never be established.

A phase 2 for PAREF Nl of 4 years is needed to take care of young biomass energy plantations (maintenance and protection) handed over to Districts and DFNC, to experiment and initiate with participatory management of the established biomass energy plantations in order to show financial feasibility of these plantations, thus attracting future investments to safe guard Rwandese forest plantations.

Based on the objectives of the afforested sites (biomass energy production) it is recommended to decrease planting distances to 1.8*1.8 – 2*2 meter in order (in line with international standards for biomass energy plantations) to increase production per hectare. The 2.5*2.5 m used is for the production of timber trees.

It recommended that measuring of sites should follow the following guidelines. Full planting sites should be GPS measured before planting. Agroforestry sites should give the number of plants planted, divided by an approved number of plants per ha (e.g. 1,600 plants per ha and 2.5*2.5 m planting distance). Roadside plantations should be expressed in hectares based on the width of public land on each side of the road (resulting in 1 hectare per km measured in case of 10 meter on each side).

Indicators on production of biomass and management of plantations (on private and public land) should be incorporated in the Strategic Plan for Forest Sector - 2013-2015 and collection on forest statistics should become a priority for DFNC, in order to get an idea of contribution of the forest sector to the GDP of Rwanda.

Based on findings of the Forest Cover Mapping update and FAO Wisdom findings on the percentage of trees outside forests, it almost certain that the 30% cover set as objective in Vision 2020 is reached. It is therefore recommended that a strategic shift from planting towards management and productivity increase should take place in the forest sector.

A joint donor review of the forest sector should take place in 2014 in order to come to a nationwide support strategy for the sector in line with Rwanda policies as from 2016.

7 FINANCIAL REPORT

To be done by Sebastien

8 ANNEXES

Annex 1: Logical Frame Work

Global objective	Impact indicators	Means of Verification	Risks & Assumptions
The implementation of the National Forest Policy contributes to poverty reduction, economic growth and environmental protection	Creation of at least 4000 jobs for of tree loggers and charcoal makers with an annual revenue of more than 1 billion RWF starting from the 7th year Contribution of more than 2 billion RWF to BNP starting from the 7th year Contribution in tons of sequestered carbon by creating forest plantations.	Surveys and accounts of loggers and charcoal makers National statistics on fiscal forestry revenues Specific study on charcoal absorption	
Specific objective	**Effect indicators**	**Means of Verification**	**Risks & Assumptions**
The qualitative and quantitative degradation of forest resources is controlled and the fuel wood needs of Rwanda are better assured	Increase of productive forests with 10.000 at state lands of the 9 districts Increase ≥ 50% of carbon production near the coalman made at the level of 9 districts Annual production of at least 29.000 tons of firewood and 12.000 tons of charcoal starting from the 7th year respectively corresponding to 3% and 8% of the national annual consumption Average annual contribution to forestry funds ≥ 225 MO Rfw starting from the 7th year on the basis of forestry fiscality	Forestry inventory reports (2007) and SIEP Update of the inventory and forest cover cartography of C-GIS Evaluation report of carbonization efficiency production National statistics and fiscal forestry revenues Mid-term and final evaluation project review report	Maintaining the state land intended to have forests - creation of a forest cadaster Control of demand of woody biomass for fuel Implementing rules and regulations regarding and decentralized forest management and 'the tax system

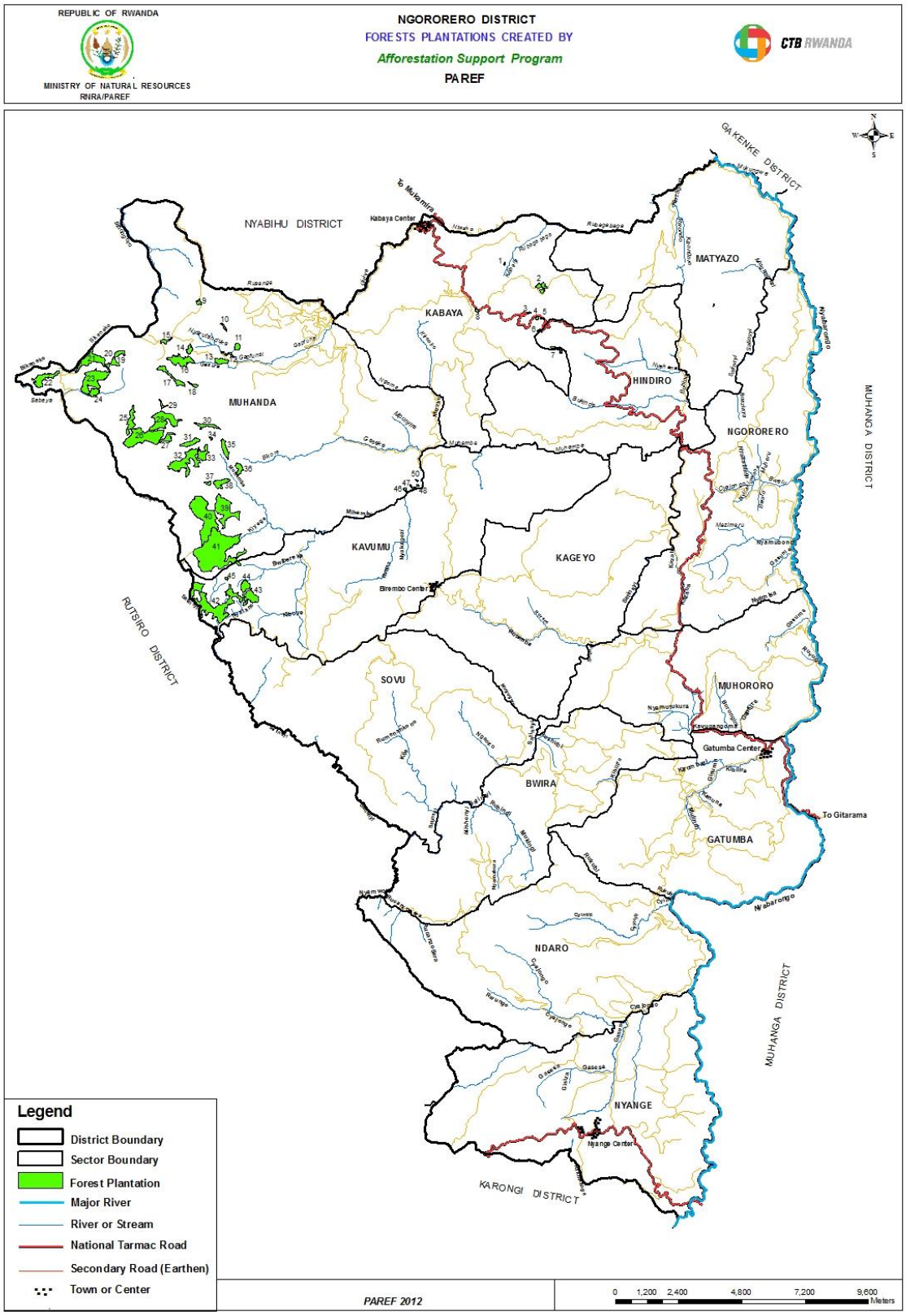
Result 1	Result indicators	Means of Verification	Risks and Assumptions
Institutional capacities at the decentralized level regarding afforestation and management of forestry resources are reinforced	Achievement rate for reforestation objectives of the project is more than 90% in the 9 districts at the end of the project. Number of staff trained in districts in implementing biomass energy plantations operations management and the application of relevant rules and regulation regarding decentralized forest management. Updated situation of forestry assets of the 9 districts available. The management tools to manage the created biomass energy plantations are available A framework of operational dialog regrouping in a regular way stakeholders in the forestry sector at the district level (JAF, joint forest action)	Districts execution reports annual financial and technical audits. Training reports. Tender document for the implementation of reforestation operations and plantation management and mapping reports and management plans. Plantation management plans. Training workshops reports on decentralized resource management. District dialog framework meetings reports (JAF, joint forest action)	Local governments shall be given competent staff in line with national planning (i.e. district foresters) Actors are mobilized and take active part in the consultation framework (JAF) The personnel is trained and maintained in place.
Result 2	**Results indicators**	**Means of Verification**	**Risks and Assumptions**
The forest resources in 9 districts (7 in western and 2 in northern province) are increased and diversified and their management improved	10.000 ha of reforestation for the production of wood energy. Success rate of plantations at the end of project ≥ 80% Number of recorded operators, trained, contracted for implementation, maintenance and management of biomass plantations	Project reports, DFMPs and district forestry maps actualized. Plantation evaluation reports Training programs and performance evaluation reports of operators Operators data bases Workshops reports Management plans of reforested sites Plantation management contracts	Operationalization of the forest tree seed center for seed supply. Availability of operators specialized in reforestation. The roles of different actors (institutional and wood value chain) are well defined
Result 3	**Results indicators**	**Means of Verification**	**Risks and Assumptions**
A better valorization of forest products is assured	Number of organized and supported groups of charcoal makers Number of trained charcoal makers in improved carbonization techniques Percentage of acceptance by charcoal makers of the casamance kiln at the level of the 9 districts	Study of wood energy value chain at the level of the 9 districts including census and evaluation of local carbonization practices Training modules and reports	Forestry taxation system is clearly determined in the new forestry law and is provides incentives to accept improved carbonization techniques.

N°	Activity per result	Means	Costs	%
According to result 1: Institutional capacities at decentralized level shall be reinforced in forestry resources management			**735.055 €**	**7.4%**
1	Train districts human resources on intervention implementation	10 project opening workshops (9 districts + 1 national) bringing together all actors	10.000 €	
		Consultancy for the realization of a diagnostic survey regarding districts capacities and preparation of a manual on procedures and management of intervention implementation (financial operational management): 1CI and 1CN (3months)	70.000€	
		Publication and multiplication of training documents	10.000€	
		Acquisition of training material	10.000€	
		Training sessions of districts staff involved in intervention implementation (planning procedures, technical follow up of sites ,financial and administrative management	33.750€	
		Annual financial and technical audit	60.000€	
		SUB TOTAL	**193.750€**	**1.9%**
2	Strengthen the operational capacity of districts to implement interventions	Salaries of 9 districts forest officers	129.600€	
		Equipment for 9 districts : computer equipment+ GPS + Motorcycles + office equipment	122.580€	
		Support to districts operations regarding the intervention frame work	9.000€	
		SUB TOTAL	**261.180€**	**2.6%**
3	Strengthen the skills of districts regarding decentralized and sustainable management of forest resources	Consultancy (CI -2 missions – total 1 month and CN-2 months) for the preparation of a decentralized forestry resources management guide in line with the new forest law and its application rules and regulations	50.000€	
		Training of District Forest Staff on decentralized forestry resources management	26.875€	
		Workshop on sustainable management of plantations (involvement of surrounding population)	56.250€	
		Contracting out the update of the districts forest mapping	45.000€	
		Concentration meeting of actors (JAF, joint forestry action)	27.000€	
		Study funds (action research, capitalization of reforestation experiences experiences exchange.)	75.000€	
		SUB TOTAL ACTIVITY 3	**280.125€**	**2.8%**

N°	Activity per result	Means	Costs	%
Result 2: Forestry resources in the 9 districts (7 in the west province and 2 in the north) are increased and diversified and their management improved.			**6.633.200 €**	**66.3 %**
4	Support the 9 districts in operational planning of the intervention	Periodical planning evaluation and actualization workshops of the project interventions at the level of the 9 districts (2 workshops /year for 4 years, or 72 workshops in total)	27.000 **€**	
		9 workshops for the validation of reforestation operation specifications	4.500 **€**	
		Training sessions for local operators on project implementation and contract modalities	2.700 **€**	
		Sub total of activity 4	**34.200 €**	**0.00%**
5	Reinforce technical and organizational capacities of local operators	Consultancy for the preparation of technical guides of reforestation site management from the plant production, sites preparation, to planting and site maintenance. National consultant (1month)	35.000 **€**	
		Publishing and multiplication of training documents	10.000 **€**	
		Training of operators for the implementation of intervention (2 workshops per year to take care of needs in capitalization and renewal of some operators ie 72 workshops)	27.000 **€**	
		Training of operators for a sustainable management and exploitation of plantation	9.000 €	
		Workshop for organization and structuring of forestry management groups (FMG) at the level of each district (consultancy for the preparation of a practical guide for the setup and organization of FMGs)	18.000 **€**	
		Sub total of activity 5	**99.000 €**	**0.01%**
6	Reforest/and or reconvert districts degraded forests	Reforestation funding to contract out reforestation and maintenance (2 years) operations (see detailed table 650 €/ ha* 10.000ha)	6.500.000 **€**	
		Sub total activity 6	**6.500.000 €**	**65 %**

N°	Activity by result	Means	Costs	%
Result 3: A better valorization of forest products is assured			**152.375 €**	**2%**
7	Support a better valorization of forestry products	Value chain surveys are carried out on the level of Distirict interventions	50.000 €	**0%**
		Training of charcoal makers on Casamance kiln techniques	65.500 €	
		Workshops on organization and structural development of charcoal makers	36.875 €	
		Sub total activity 7	**152.375 €**	
Management and coordination of project				
8	Ensure the project management and bring a technical support to 9 districts and various actors of decentralized forestry.	PMU staff: 1 intervention director and 1 co-management delegate1, 1 TA national, 1 in charge of follow up-evaluation, 1 in charge of training and communication, 1 accountant, 4 supervisors, 9 district forest officers, 5 drivers and 2 guards Logistics: 5 vehicles Equipment: Offcie furniture and IT equipement for 8 offices (4 supervisors & 4 PMU) Operational means	**1.927.409 €**	**19%**
Budget reserve			**551.961 €**	**5,5%**
PAREF TOTAL BUDGET			**10.000.000€**	**100%**

Annex 2 Program impact areas (District Maps, site overview with detailed data) example



Id Map	Site Name	Type	Year	Cell	Sector	Disitrict	Area_Ha (no slope corr).	Slope	Slope corr factor	Area (ha) with slope corr.	No plants	Species	Area (plants)
1	Kabusizi	Reconversion	2010	Busunzu	KABAYA	NGORORERO	0.4899	56	0.8725	0.5614	896	E.maideni	0.56
2	Busunzu	Reconversion	2010	Busunzu	KABAYA	NGORORERO	7.7534	35	0.9439	8.2142	13715	E.md	8.57
3	Gatovu	Reconversion	2010	Nyenyeri	KABAYA	NGORORERO	0.6156	33	0.9496	0.6482	1106	E.md	0.69
4	Bukonde I	Reconversion	2010	Nyenyeri	KABAYA	NGORORERO	1.2389	40	0.9285	1.3343	1,994	E.md	1.25
5	Bukonde II	Reconversion	2010	Nyenyeri	KABAYA	NGORORERO	0.6243	62	0.8499	0.7346	1,007	E.md	0.63
6	Karuhura	Reconversion	2010	Nyenyeri	KABAYA	NGORORERO	0.6582	51	0.8908	0.7389	1,256	E.md	0.79
7	Gatwebano	Reconversion	2011	Nyenyeri	KABAYA	NGORORERO	3.1808	31	0.9552	3.3300	5,338	E.md	3.34
8	Butipfuna	Reconversion	2010	Gaseke	KABAYA	NGORORERO	1.2368	58	0.8650	1.4298	2,120	E.md	1.33
9	Rutare I	New	2011	Bugarura	MUHANDA	NGORORERO	2.6554	22	0.9767	2.7188	4,456	E.md	2.79
10	Rutare II	New	2011	Bugarura	MUHANDA	NGORORERO	1.8566	13	0.9916	1.8723	3,022	E.md	1.89
11	Butimba I	New	2011	Bugarura	MUHANDA	NGORORERO	4.0606	54	0.8799	4.6148	7,384	E.md, A.ml	4.61
12	Butimba II	New	2011	Bugarura	MUHANDA	NGORORERO	2.8820	11	0.9940	2.8994	4,764	E.md, A.ml	2.98
13	Butimba III	New	2011	Bugarura	MUHANDA	NGORORERO	8.5436	31	0.9552	8.9443	16,302	E.md, A.ml, A.ac	10.19
14	Butimba IV	New	2011	Bugarura	MUHANDA	NGORORERO	5.1565	39	0.9317	5.5345	9,022	E.md	5.64
15	Butimba V	New	2011	Bugarura	MUHANDA	NGORORERO	3.9912	34	0.9468	4.2154	6,910	E.md	4.32
16	Gasura I	New	2011	Bugarura	MUHANDA	NGORORERO	25.6891	27	0.9654	26.6098	43,884	E.md, A.ml	27.43
17	Gasura II	New	2011	Bugarura	MUHANDA	NGORORERO	13.6861	36	0.9409	14.5458	23,861	E.md, A.ml	14.91
18	Kintasi	New	2011	Bugarura	MUHANDA	NGORORERO	2.5509	38	0.9348	2.7288	4,680	E.md	2.93
19	Bweru	New	2012	Bugarura	MUHANDA	NGORORERO	11.7289	29	0.9604	12.2126	20,136	E.md, A.ml	12.59
20	Gikungu I	New	2012	Bugarura	MUHANDA	NGORORERO	1.7679	24	0.9724	1.8181	3,167	E.md, A.ml	1.98
21	Gikungu II	New	2011	Bugarura	MUHANDA	NGORORERO	32.3635	31	0.9552	33.8814	57,258	E.md, A.ml	35.79
22	Gikungu III	New	2012	Bugarura	MUHANDA	NGORORERO	21.4475	26	0.9678	22.1611	37,389	E.md, P.fu, A.ml	23.37
23	Gikungu IV	New	2011	Bugarura	MUHANDA	NGORORERO	49.7749	41	0.9253	53.7933	90,809	E.md, A.ml	56.76
24	Gateka	New	2011	Bugarura	MUHANDA	NGORORERO	8.6993	36	0.9409	9.2458	16,026	E.md, A.ml	10.02
25	Kintobo	New	2011	Bugarura	MUHANDA	NGORORERO	17.0539	48	0.9015	18.9172	33,150	E.md, A.ml	20.72
26	Kagano gato	New	2011	Bugarura	MUHANDA	NGORORERO	64.1223	45	0.9119	70.3172	119,152	E.md, A.ml, A.ac	74.47
27	Kumusumari	New	2011;2012	Bugarura	MUHANDA	NGORORERO	8.4341	36	0.9409	8.9639	14,318	E.md, A.ml	8.95
28	Nyakaziba	New	2011	Bugarura	MUHANDA	NGORORERO	43.7574	39	0.9317	46.9651	80,611	E.md, A.ml	50.38
29	Rongero	New	2011	Bugarura	MUHANDA	NGORORERO	2.4008	17	0.9858	2.4354	4,315	E.md, A.ml	2.70
30	Nyamugari	New	2011	Bugarura	MUHANDA	NGORORERO	8.7320	17	0.9858	8.8577	14,737	E.md	9.21
31	Gatagara I	New	2011	Rutagara	MUHANDA	NGORORERO	10.7090	38	0.9348	11.4559	19,402	E.md, A.ml	12.13
32	Gatagara II	New	2011	Rutagara	MUHANDA	NGORORERO	47.1017	39	0.9317	50.5545	86,759	E.md, A.ml	54.22
33	Nyarwayi II	New	2011;2012	Rutagara	MUHANDA	NGORORERO	13.3685	43	0.9187	14.5516	24,319	E.md, A.ml	15.20
34	Gaseke	New	2011	Rutagara	MUHANDA	NGORORERO	0.6158	10	0.9950	0.6189	1,243	E.md	0.78
35	Nyakanaba	New	2011	Rutagara	MUHANDA	NGORORERO	10.5171	44	0.9153	11.4903	19,132	E.md	11.96
36	Rugogwe	New	2011	Rutagara	MUHANDA	NGORORERO	7.6810	43	0.9187	8.3607	14,334	E.md	8.96
37	Humiro	New	2011	Rutagara	MUHANDA	NGORORERO	2.1558	40	0.9285	2.3218	4,023	E.md	2.51
38	Nyarwayi I Kageshi	New	2011	Rutagara	MUHANDA	NGORORERO	12.8461	45	0.9119	14.0871	22,904	E.md, A.ml	14.32
39	Gahinda	New	2010	Rutagara	MUHANDA	NGORORERO	49.6339	39	0.9317	53.2724	84,013	E.md, A.ml	52.51
40	Nyatubindi	New	10;2011;20	Rutagara	MUHANDA	NGORORERO	90.6305	34	0.9468	95.7230	165,558	E.md, A.ml, A.ac	103.47
41	Kiyege	New	09;2010;20	Rutagara	MUHANDA	NGORORERO	169.4986	36	0.9409	180.1451	306,055	E.md, E.mi, A.ac, A.ml	191.28
42	Buganamana I	New	2010	Rugeshi	KAVUMU	NGORORERO	90.9779	35	0.9439	96.3851	165,745	E.md, A.ml	103.59
43	Buganamana II	New	2010	Rugeshi	KAVUMU	NGORORERO	19.6011	45	0.9119	21.4948	34,341	E.md, A.ml	21.46
44	Kadobogo	New	2011	Rugeshi	KAVUMU	NGORORERO	10.8029	37	0.9379	11.5182	19,981	E.md, A.ml	12.49
45	Kivugiza Kugati	New	2012	Rugeshi	KAVUMU	NGORORERO	0.9509	21	0.9787	0.9716	1,702	E.md, A.ml	1.06
46	Rusura I	Reconversion	2011	Ngoma	MUHANDA	NGORORERO	1.2961	40	0.9285	1.3959	2,358	E.md, A.ml	1.47
47	Rusura II	Reconversion	2011	Ngoma	MUHANDA	NGORORERO	1.0358	47	0.9050	1.1445	1,966	E.md, A.ml	1.23
48	Rusura III	Reconversion	2011	Ngoma	MUHANDA	NGORORERO	0.5126	42	0.9220	0.5560	1,011	E.md, A.ml	0.63
49	Rusura IV	Reconversion	2011	Ngoma	MUHANDA	NGORORERO	0.0902	8	0.9968	0.0905	145	E.md, A.ml	0.09
50	Rusura V	Reconversion	2011	Ngoma	MUHANDA	NGORORERO	0.3464	58	0.8650	0.4005	699	E.md, A.ml	0.44
							897.5243			**957.7827**	**1,618,475**		**1,011.55**
		Reconversion					**19.08**			**20.58**	**33,611**		**21.01**
		New					**878.45**			**937.20**	**1,584,864**		**990.54**