Enabel

PROJECT FINAL REPORT

Forest Management and Woody Biomass Energy Support Project / FMBE

RWA1509811

Belgian development agency

enabel.be

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Acronyms

AfDB	African Development Bank
BEST	Biomass Energy Strategy
BTC	Belgian Technical Cooperation, the Belgian development agency
DC	Direct Costs
DELCO	ENABEL's Delegate to the Co-Management of the Intervention
DFMP	District Forest Management Plan
DFNC	Department of Forests and Nature Conservation
DFO	District Forest Officer
DG	Director General
DI	Director of Intervention
EKN	The Embassy of the Kingdom of Netherlands
ENABEL	The Belgian Development Agency
FMBE	Forest management and Woody Biomass Energy Support Project
FMES	Forest Monitoring and Evaluation System
FFS	Farmer Field School
FMU	Forest Management Unit (150- 200Ha)
FOA	Private Forests Owners Association / Cooperative
FSSP	Forest Sector Strategic Plan
GCF	Green Climate Fund
GMO	Gender Monitoring Office
ITA	International Technical Assistant
IUCN	International Union for Conservation of Nature
LAFREC	Landscape Approach to Forest Restoration and Conservation project (World Bank funded through REMA)
M&E	Monitoring and Evaluation
MIGEPROFE	Ministry of Gender and Family Promotion
MINILAF	Ministry of Lands and Forestry
MININFRA	Ministry of Infrastructures

MINIRENA	Ministry of Natural Resources
MOE	Ministry of Environment
NFMP	National Forest Management Plan
NFP	National Forest Policy
NST	National Strategy for Transformation
OECD- DAC	Organization for Economic Cooperation and Development (OECD)- Development Assistance Committee (DAC)
PAREF Be1	Belgian support program to the afforestation and reforestation in Rwanda (2006-2011)
PAREF Be2	Belgian support program to the afforestation and reforestation in Rwanda (2010-2016)
PAREF NL	Support Program to the afforestation and Reforestation in Rwanda- supported by the Kingdom of Netherlands
PFMU	Private Forest Management Unit (consolidated block of 30-50 ha)
PGREF	Rwanda Sustainable Woodland Management and Natural Forest Restoration Project (AfDB funded)
PSC	Project Steering Committee
RBC	Region Bruxelles Capitale
RBM&E	Results Based Monitoring and Evaluation System
RFA	Rwanda Forestry Authority
RLMUA	Rwanda Land Management and Use Authority
RNRA	Rwanda Natural Resources Authority.
RWB	Rwanda Water Resource Board
RWFA	Rwanda Water and Forestry Authority
SC	Steering Committee
SFMP	Simplified Forest Management Plan
SIDA	Swedish Development Agency
SPIU	Single Project Implementation Unit
TWG	Thematic Working Group (TWG)
WRI	World Resource Institute

Intervention form

Intervention title	Forest management and Woody Biomass Energy Support Project (FMBE)
Intervention code	RWA1509811
Location	Kigali, Rwanda Intervening in 7 districts: Rwamagana (Eastern Province), Gasabo, Kicukiro & Nyarugenge (City of Kigali) and Gakenke, Gicumbi & Rulindo (Northern Province)
Total budget	€ 3.800.000 (FMBE)[1] + € 835,653 (€ 771,750 as direct contributions) from Region Bruxelles Capital (RBC) in the context of Climate Convention
Partner Institution	Ministry of Environment (MoE)[2]) through Rwanda Forestry Authority (RFA)
Start date (Specific Agreement)	20/12/2016
Date of intervention start /Opening steering committee	01/02/2017[3] – opening SC was on 18/04/2017
End date of Specific Agreement	20/06/2021
Target groups	Private Small holder Forest Owners; Crop farmers for Agroforestry; Districts (District Forest Officers -DFO's) and Staff of Rwanda Forestry Authority at central level
Impact	Improvement of sustainable management of forest resources contributes to poverty reduction, economic growth and environmental protection.
Outcome	Woody biomass production capacity is increased on selected private and public land in the districts of the intervention
Outputs	Result 1: District Forest Management Plans (DFMP) are developed and implemented
	Result 2: Improved capacity of RNRA and districts for monitoring forest management, gender integration and benefitting from climate change opportunities
Period covered by the report	2017- 2021

[1] The initial budget of FMBE was 3 Million Euro from the Belgian Government , plus 800.000 Euro of in-kind contribution of the GoR. In July 2017, the project benefited from a top-up financing of 627.998 EUR (565000 EUR direct contribution to field activities) from the Brussels Capital Region in order to scale up activities contributing to mitigation and adaptation of climate change effects.

[2] Following the Rwanda Presidential elections of 03rd and 04th August 2017, a new cabinet was formed on 31st August 2017, in which the former Ministry of Natural Resources (MINIRENA was split into new Ministry of Lands and Forestry-MINILAF; Ministry of Environment –MoE and Rwanda Petroleum and Mining Board), and later on 18th October 2018 MINILAF was dissolved again , Forestry sector went back to MoE.

[3] From 01/02/2017 onwards, the ITA and DELCO took up their role and joined the RNRA/SPIU office to start up the FMBE-project. The opening SC was held later shortly ,on 18/04/2017.

Global appreciation

Describe your global appreciation of the intervention (max 200 words):	**Describe** your global appreciation of the intervention (max 200 words):
The FMBE project has been instrumental in supporting the Government of Rwanda to design and pilot implementation of different innovative approaches towards sustainable management of forestry resources as stipulated in the revised National Forestry Policy (NFP) of 2018 and the 5 years Forest Sector Strategic Plan (FSSP,2018-2023) . The supported innovations included: • Approach to sustainable management of public forests by fostering the Public-Private Partnerships (PPPs) through concessions to private operators ; • Approach to sustainable management of privately owned smallholder forests, which consititute about 70% of Rwandan Forests , through rehabilitation and management under PFMUs (Private Forests Management Units)[4]. • Planting and upscaling agroforestry trees through the Farmer Field School (FFS) extension approach. • Approach to planting and sustainable management of trees on roadsides, riversides and lakeshores, through engagement of Community Vigilance Committees (CVCs). Not only the FMBE project supported with the roll out of the above innovative approaches, but also supported the development of District Forests Management plans (DFMPs) in the Districts of Intervention , as well as supporting the development of a National Forests Monitoring and Evaluation System (FMES). Last but not least, the FMBE project had an exponential effect by catalyzing funds mobilisation for the Forestry sector , with a happy end of the project marked with the approval on 01st July 2021 of 33.7M USD Grant aquired from the Green Climate Fund (GCF). These funds	The FMBE project was conceived in 2016 followiing the closure of another 8 years two-phased Belgian funded program (PAREF Be1& PAREF Be2) which had significantly contributed in planting trees on over 8000 ha, mainly focusing on public lands that needed afforestation and reforestation, as well as increasing tree density in crop lands (Agroforestry). FMBE supported the former MINERANA (currently MoE) in doing things differently, starting with the revision of the National Forestry Policy (NFP) and development of a 5 years National Forestry Sector Strategy (FSSP) which were both approved by Rwanda Cabinet in March 2018. The project hence focused on piloting the innovative approaches from policy documents to on ground implementation proofing. Of a particular emphasis, while the previous program (PAREF) had supported forests rehabilitation on public lands, FMBE focused on rehabilitation of the very degraded Private Smallholder forests through land use consolidation and grouping of land owners into business cooperatives, the PFMU approach (Private Forests Management Units). By the end of the project, 19 forest cooperatives were created , with about 870ha of very degraded forest lands rehabilitated. These kinds of forest cooperatives are promising since the members will no longer cut their forests as they want, rather they will be linked to markets with Business Operators who will purchase their tree harvests at the right time. This approach has demonstrated potential to generate higher economic returns as well as more sustained Carbon sequestration, contributing to Rwanda's Green Economy. The FMBE project also leveraged the Farmer Field Schools/ TWIGIRE MUHINZI Extension approach upscaled in country by another former Belgian funded SPAT II, and the FFS facilitators at cell level were trained to include Agroforestry practices in their technical packages that they deliver to farmers. About 3,500 ha of agroforestry lands have been planted in

[4] The PFMU approach consists in aggregating a number of adjacent forest lands (0.3ha on average) to form a sizable unit of 50 to 100 ha, and grouping the owners into a business cooperative, every committing to respect the agreed upon production cycle and management plan, with expected higher returns at harvesting.

mobilised through strong partnerships and collaboration initiated between Enabel (FMBE team), IUCN and RFA ascertain the scalability and sustainability of all efforts and initiated actions under FMBE project.	blocks of 200-300ha with an average of 100 trees per hectare. All the piloted approaches will be easily upscaled and sustained towards greater impact through the mobilised third party financing , namely the recently acquired GCF Grant focusing on the Eastern Province.
Score your global appreciation of the intervention[5]:	**Score** your global appreciation of the intervention[6]:
A (Very satisfactory)	**A (Very satisfactory)**
National execution official[7]	Enabel execution official[8]
 RFA(Acting Director General) **Spridio Nshimiyimana,** **Acting Director General** **Rwanda Forestry Authority**	 **Vincent Nsabuwera** **Intervention Manager, FMBE** **Enabel / Rwanda**

[5] Very satisfactory - Satisfactory - Non satisfactory, in spite of some positive elements - Non satisfactory

[6] Very satisfactory - Satisfactory - Non satisfactory, in spite of some positive elements - Non satisfactory

[7] Name and Signature

[8] Name and Signature

1 Assessing the intervention strategy

1.1 Context

*In this chapter, the Final Report should describe contextual elements/evolutions that had a **crucial** influence on the intervention, and it's attainment of results (general context, Institutional Context, execution Modalities contexts, Harmo-dynamics context). Only mention the most noteworthy elements.*

1.1.1 General context

The formulation of FMBE project in 2016 followed the closing of an 8years two-phased program (PAREF Be1 &2-Programme d'Appui à la Reforestation au Rwanda). FMBE built upon lessons learnt from this Belgian funded program, as well as other parallel projects which were initiated in the same period, namely the Dutch funded PAREF-NL (whose first phase was also delegated to BTC for implementation from 2008 to 2011, in parallel to PAREF Be1), as well as the AfDB -funded PGREF Project.

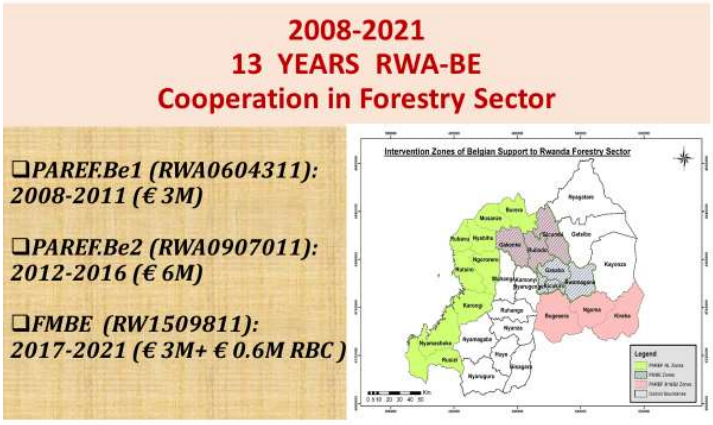
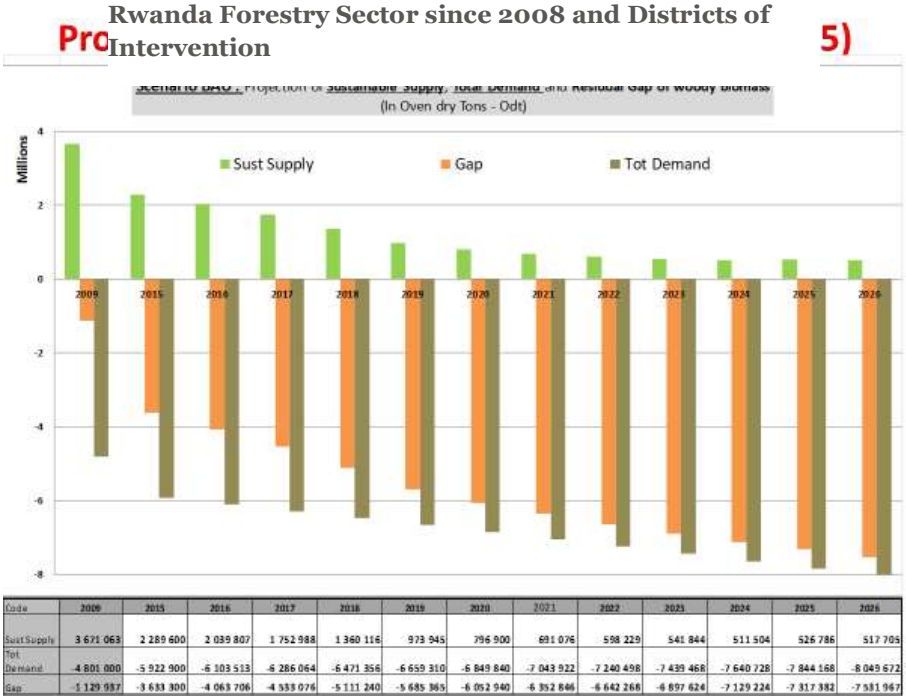


Figure 1 : Mapping of Belgian funded interventions in Rwanda Forestry Sector since 2008 and Districts of Intervention

All these interventions had been designed to increase Rwanda's Forest Cover, mainly focusing on afforestation of hilly public lands. The National Forest Inventory (NFI) conducted in 2015 under financing of PAREF Be2 revealed that despite the efforts being deployed in afforestation of public lands for so many years, if the forests management remained as a business as usual, in the next 10 years there could be no standing tree due to exponential increases of wood demands, mainly for cooking energy . In 2015, the annual total demand was estimated at 5.9million tons of wood , while the sustainable supply was estimated at 2.2million tons , which means that the gap of 3.7millions tons were being supplied through overexploitation of existing wood stocks, cutting unmatured trees.



Code	2009	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Sust Supply	3 671 063	2 289 600	2 039 807	1 752 988	1 360 116	973 945	796 900	691 076	598 229	541 844	511 504	526 786	517 705
Tot Demand	-4 801 000	-5 922 900	-6 103 513	-6 286 064	-6 471 356	-6 659 310	-6 849 840	-7 043 922	-7 240 498	-7 439 468	-7 640 728	-7 844 168	-8 049 672
Gap	-1 129 937	-3 633 300	-4 063 706	-4 533 076	-5 111 240	-5 685 365	-6 052 940	-6 352 846	-6 642 268	-6 897 624	-7 129 224	-7 317 382	-7 581 967

Figure 2 : Projection exercise of supply and demands for wood biomass in a 10 year period, from 2015.
Data source: NFI, 2015.

In that context, the mission of FMBE project was:

(1) To support the revision of the National Forestry Policy (NFP) and development of a 10 year Forestry Sector Strategy (FSSP) which were initiated towards end of PAREF Be2

(2) To pilot implementation of innovative actions towards sustainable management of Forest resources at risk of total depletion.

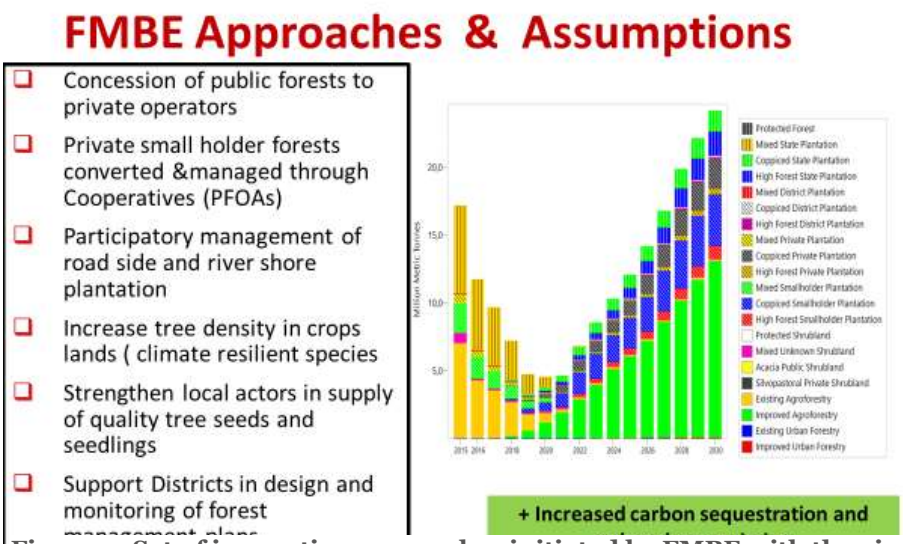


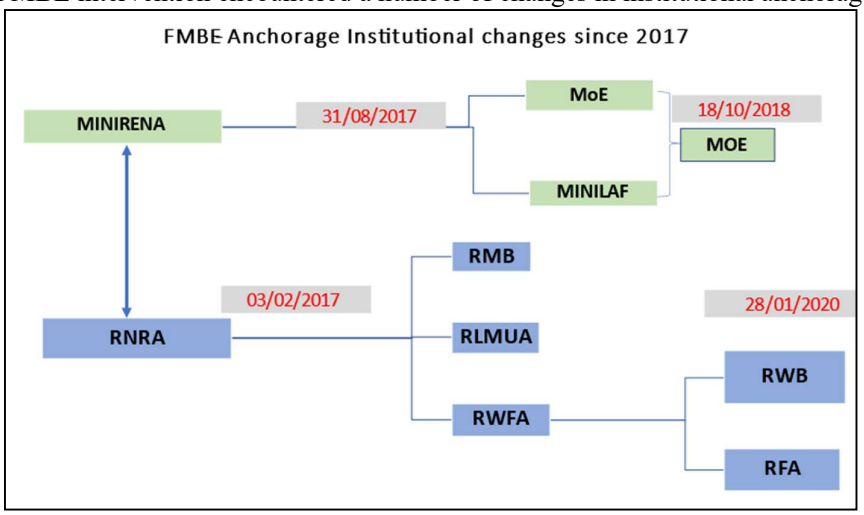
Figure 3: Set of innovative approaches initiated by FMBE with the aim of improving sustainable supply of wood from various potential sources

With these, the project worked out on various approaches and assumptions to reverse the situation of decreasing sustainable supply of wood biomass as highlighted in Fig3.

Both revised NFP and a 5 years FSSP were approved by Rwanda Cabinet in March 2018, and key strategic actions were included in the 7 years NST1 (2017-2024), namely targets to have 80% of public forests managed under concessional Public -Private -Partnerships (PPPs), and a commitment to halve the number of households depending on firewood as a source of energy for cooking from 79.9% (2016/17) to 42% by 2024.

1.1.2 Institutional context

From its early start in 2017, FMBE intervention encountered a number of changes in institutional anchorage:



- On 03rd February,2017 The former Rwanda Natural Resources Authority (RNRA) reporting to Ministry of Natural Resources (MINIRENA), was split into 3 Agencies (RMB- Rwanda Mining and Petroleum Board; RLMUA- Rwanda Land Management and Use Authority ; and RWFA- Rwanda Water and Forestry Authority). The anchorage of the Intervention shifted from RNRA to RWAFA.

- On 31st August 2017, after the presidential elections and formation of a new Cabinet, the former line Ministry of Natural Resources (MINIRENA) was also split into 2 Ministries (MOE- Ministry of Environment and MINILAF- Ministry of Lands and Forestry). However MINILAF was dissolved after one year in cabinet reshuffle of 18th October 2018 and its mandates were taken up by MoE.

- On 28th January 2020, the Cabinet approved the splitting of RWFA into Rwanda Water Board (RWB) and Rwanda Forestry Authority (RFA), and the institutional anchorage shifted to RFA, with MoE as line Ministry.

All these changes were always accompanied with changes in Heads of Institutions and new nominations which constituted somehow a sustainability risk for the intervention.

However, the negative effects of these changes were minimized through the Co-management modality by which Enabel delegated intervention manager and the ITA maintained the momentum of the project and played the transitional buffer amidst those changes.

1.1.3 Harmo- context

The FMBE intervention has been not only active in the coordination of Forestry and Biomass subsector, but also in building up new partnerships for joint efforts in resources mobilisation and expanded impact creation.

- From 2016, Enabel (BTC) has been co-chairing both the Biomass and Forestry Thematic working Groups, and these responsibilities were conferred to the FMBE Management.
- A number of strategic actions have been undertaken under this leadership, including
    (1) The revision of the country Biomass Energy Strategy (BEST) in collaboration with MININFRA and other key partners, namely the EU Delegation. With the support of Enabel Study Fund, an internationally applied energy mix modelling software (LEAP) was customized for Rwanda to support the periodic scenarios analyses and modelling of the supply and demands of wood biomass for energy in Rwanda.

    (2) The leadership taken in revising the NFP and development of FSSP documents validated in 2018;

    (3) The development of a 10 years National Forests Management Plan (NFMP) and country-wide expansion the development of Districts Forests Management Plans (DFMPs) done with the support of other Partners (PGREF project, PAREF NL, IUCN ….) with the technical know-how support provided by FMBE project.

    (4) Joint partnership of Enabel/FMBE project and IUCN in support of RWFA for the upgrade of the National Forest Cover Mapping, initiated end of 2018 and concluded in 2019.
- Partnerships in funds mobilisation for the forestry and biomass subsectors, including the successful acquisition of :
    (1) Enabel – IUCN joint application for EU-DeSIRA funds, with 4 million Euro acquired for research in Agroforestry, focusing on Eastern Province.

    (2) Enabel- MoE/RWFA-IUCN joint proposal development to GCF, initiated in 2017 with the first concept note , which finally resulted in a USD33.8 million TREPA project approved by the GCF Board on 01st July 2021. The project partnership expanded to include ICRAF, World Vision and CORDAID which also participated in the project development at some stages.

    (3) Enabel -MoE/RFA- IUCN joint project on Community Biodiversity enhancement in Eastern Province, approved for funding by SIDA (EUR 7.8 million, complementing GCF TREPA project).

1.2 Important changes in intervention strategy

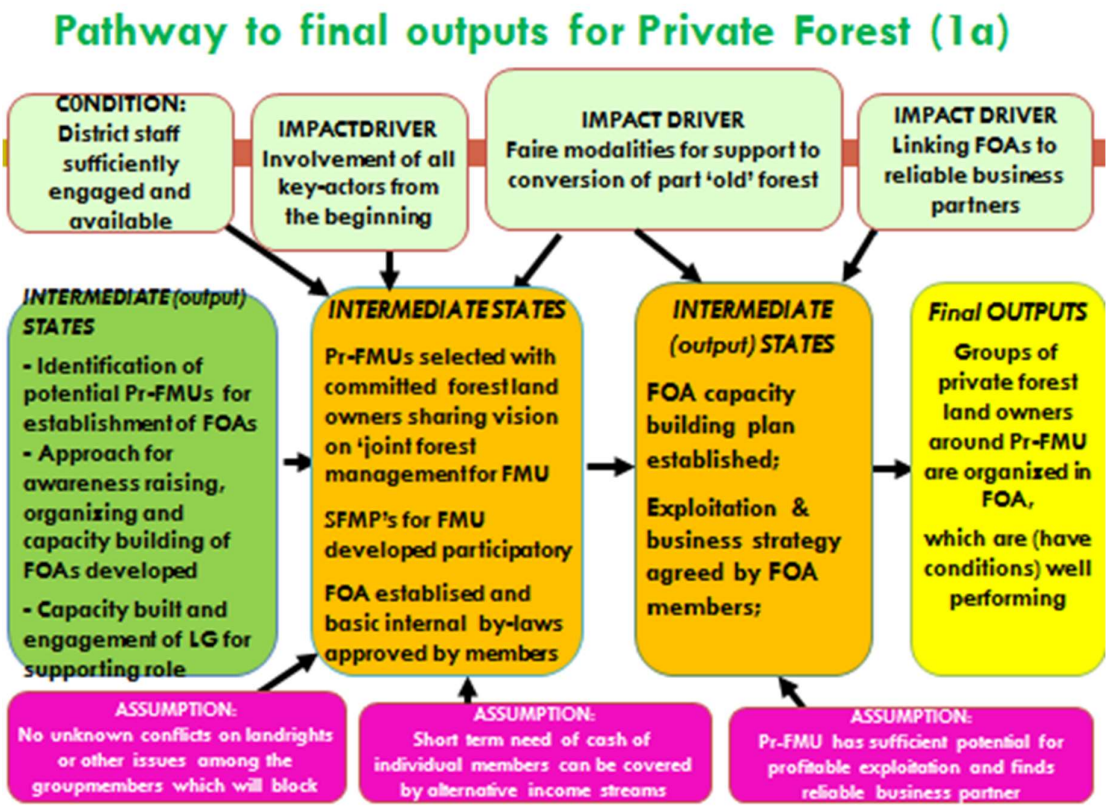
Describe how the intervention was supposed to work and how it worked out in reality. If you have visual representations of the initial and/or present intervention logic, include them here (diagram, scheme, photo, etc.). If important strategic reorientations were made, mention why this decision was made

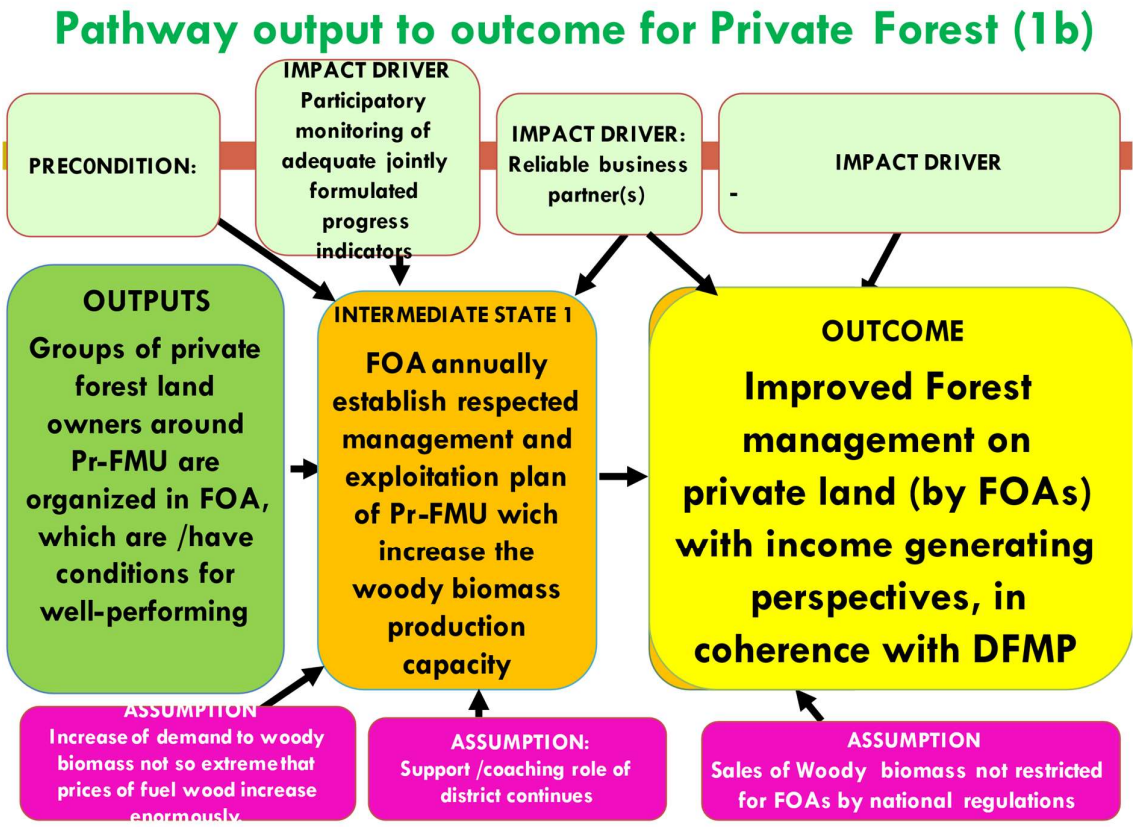
The initial intervention logic developed with the participation of project stakeholders in a workshop held in December 2015 has remained a relevant guide for the implementation of the intervention until the end. A participative workshop was held in April 2017 at the start of the intervention to ensure that the newly recruited project staff, Partner technical counter parts and District Forest officers who were going to jointly support the implementation of the project have a shared understanding of the Theory of Change, intended outcome and impact and pathways to achieve them.

Figure 4: Figure 4: Mayor of Rwamagana District opening the participative stakeholders workshop on project ToC , April 2017.

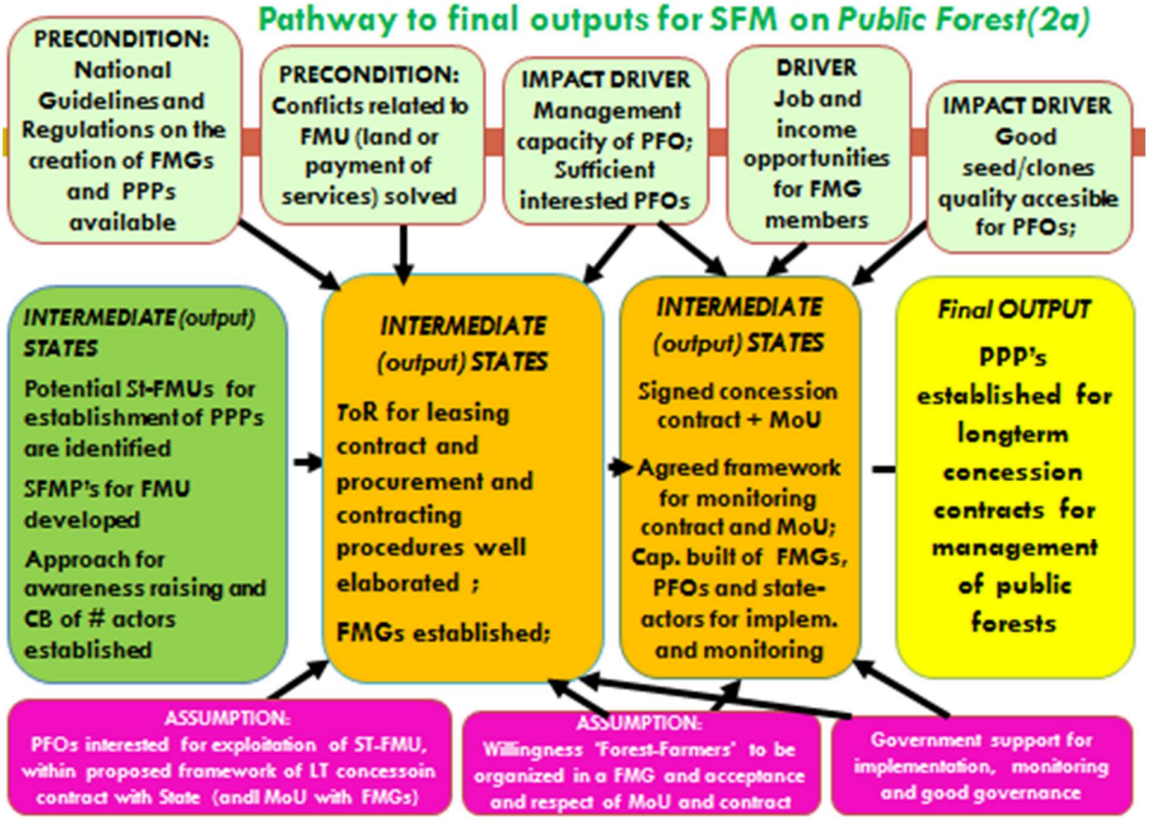
However, an operational change has happened in terms of investment budget reallocation where the project invested more in rehabilitation of private small holder forests in order to expand piloting of the PFMU approach rather than investing in rehabilitation of forests on public lands which will be subject to concessions to private investors. The rehabilitation costs of those public forests should be part of concessional agreements.

The following ToC was developed and agreed upon by stakeholders at the start of the project :

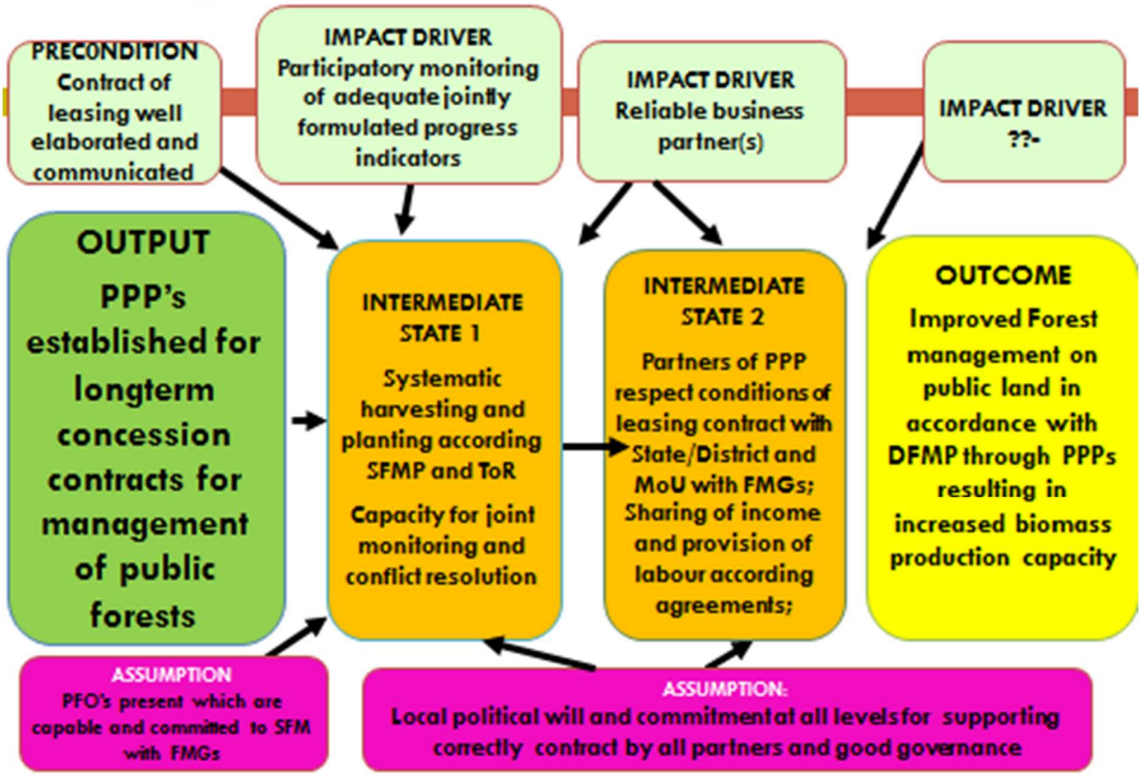


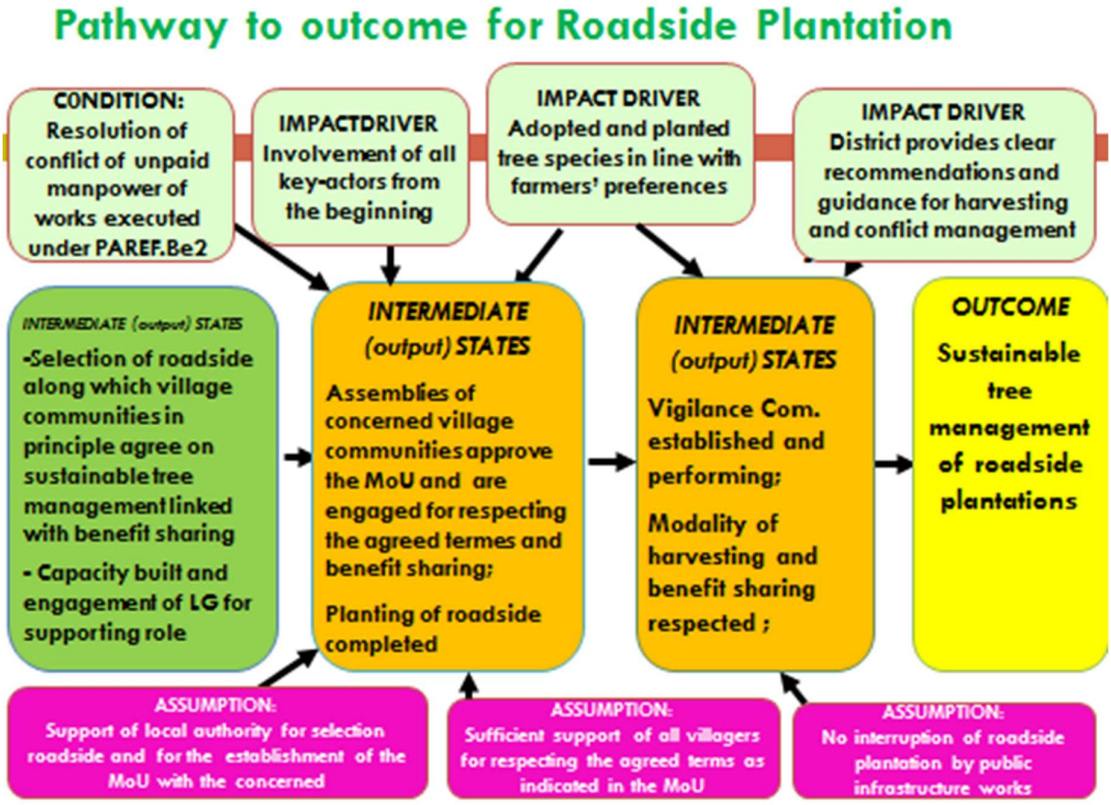


Pathway to final outputs for SFM on *Public Forest(2a)*



Pathway output to outcome for *Public* Forest (2b)





2 Results achieved

2.1 Monitoring matrix

Table 1: FMBE Project Monitoring Matrix

Results / indicators	Baseline Value	End Target	End Value obtained	Comments
IMPACT: Improvement of sustainable management of forest resources contributes to poverty reduction, economic growth and environmental protection				
Direct Contribution (= consumption X price) of forestry and wood fuel sector to GDP	5%	5%	5%	There are no recent national data to help compute Forests Contributions to GDP
Profitability and regular income of forests put under improved management (EUR/ha/year)	NPV: 160		179.02 at 6yrs 910.16 at 10yrs 1,334.22 at 20yrs	Exponential increase of profitability is projected at 20 years and above, where the annual profitability moves from 17 euro/ha/year under BAU to 67 euro/ha/year under sustainable management

OUTCOME: Woody biomass production capacity is increased on selected private and public land in the districts of intervention				
Sustainable supply of woody biomass is improved in well managed forests (m3/ha/year) on 870 ha on private land and 50 ha of public land restored	5m^3/ha/yr (private plantations) 7.04 m^3/ha/yr (Public plantations)	10-15 m3/ha/year 10-15 m3/ha/year	10-15 m3/ha/year 10-15 m3/ha/year	While the project life span was too short to carry out another end-term QQA (planted trees were only 2-3years old), considering the rapid growth and sustainable measured taken, the average productivity is expected to double the BAU from 6-7years onward
OUTPUT 1: District Forest Management Development Plans are developed and implemented				
# DFMPs developed and validated	3	7	7	7DFMPs (4 new Rwamagana, Gasabo, Kicukiro &Nyarugenge), plus 3DFMPs updated for Norther Distrcits (Gakenke, Rulindo and Gicumbi, already developed with PAREF Be2)
# Public FMUs under concession	0	3Rulindo 3Gakenke 3Gicumbi 1Rwamagana	18FMUs 5 Rulindo 4 Gakenke 4 Gicumbi 3Kigali 3Rwamagana	Each of the 7 districts of project intervention has got at least 2 FMUs earmarked for long term concession contracts to be established with a Private operator
# Private FOAs (Forest Owners Associations/ cooperatives) formed and PFMUs established	0	15 FoA	19 FoA /PFMUs	19 PFMUs in total (870 ha) rehabilitated in the planting seasons 2018/2019 &2019/2020, with average of 2600 trees/ha: • 5 PFMUs in Rwamagana (357.5ha); • 5 in Gakenke (165.5ha); • 5 in Rulindo (196ha) and • 4 PFMUs in Gicumbi (151ha)
#Km (ha) on roadsides/riversides planted, with sustainable management plans	0	250 km (ha): Rwamagana: 100km Kigali city: 50km North: 100km	700km (ha)	A total of 700 km (ha) planted with average of 600 trees/km: • 370 Km (Ha) of roadsides planted in 2018/2019 (50Km Rwamagana; 215km Kigali City; 105km in North) • 330 Km (Ha) planted in season 2019/20 (174km Kigali; 156km North) Managed through Community Vigilance committees (CVC) established at every 5km distance
#Hectares on public land afforested /Reconverted	0	500ha	50Ha	Only 50Ha of public forest land were planted in season 2018/2019(Rwamagana):

				• Private FMUs and roadsides were more prioritized; • There are not many empty spaces of public sites, only reconversion is required and it should be through Concession contract with Private Operators. The refilling spaces will continue to be planted through Government Earmarked funds.
# Trees and hectares of agroforestry planted through FFS groups		1200 ha: Rwamagana: 600ha North: 600ha)	3,494 ha	3,494 ha of Agroforestry trees planted in total (with average of 100 trees/ha): • 1262 Ha planted in season 2018/2019 (Rwamagana District) with 72 FFS Groups • 2,232 Ha planted in season 2019/20 (1,160 Ha Rwamagana ; 522ha in Rulindo and 550 ha in Gakenke), with 275 farmer groups established
OUTPUT 2: Improved capacity of RFA and Districts for monitoring forest management, gender integration and benefitting from climate financing opportunities				
Upgrading of FMES with integration of new requested indicators by MoE	System not functional	System upgraded and forestry indicators reported in the system	New DFMP/FMES system developed and ready for use	A new FMES linked with DFMP database software has been developed and it is being used gradually through projects at district level
Number of proposals submitted through project support for financing by specific donors and/or institutes related to Climate Finance or other Financing	0	5	5	A number of project proposals have been developed through FMBE support and successfully funded : • EU funded DeSIRA project (4M Eur) • GCF funded TREPA (33.7 M USD) • SIDA funded COMBIO project (8.7 M Eur) • Extensively Contributed to development of FIP (Forest Investment Program) whose Agroforestry part is being financed through AfDB (18M USD) • Worked on EPAFLEC Concept note submitted to GCF ,not yet approved.
Inclusion of gender promotion in tender	0 tender doc	All tender documents	Gender consideration	A Gender Mainstreaming Action Plan was developed in the start up phase of the

documents (according to gender integration guidelines)		include gender aspects and invite especially individual women entrepreneurs / women owned enterprises for a bid	paid for in all tenders and all project activities	project and provided guidelines about gender considerations in all tenders and project activities
Data collection templates for M&E requesting sex disaggregated information	No template	Templates of data collection and reporting developed	Baseline report, routine field activity reports and annual reports present sex disaggregated data	Every aspect of project reporting takes into account sex disaggregated data
At least one communication channel for regular updating on DFMPs (design and implementation)	0	1	1	A Web-based FMES /DFMP system has been designed and allows for regular updates and monitoring of DFMPs implementation across the entire country

2.2 Analysis of results

Describe the attainment of results by the intervention

2.2.1 To what extent will the intervention contribute to the impact[9] (potential impact)?

The general objective of the FMBE intervention was to improve the sustainable management of forest resources, contributing to poverty reduction, economic growth and environmental protection. The following two macro-level indicators were selected to track the long-term impact, though there were no planned national surveys to be able to update them in the life span of the project, but they still hold:

- Direct Contribution (= consumption X price) of forestry and wood fuel sector to GDP (the baseline was set at 5% contribution of the forestry sector in 2015).
- Profitability and regular income of forests put under improved management (RWF/ha/year)

There is a direct causal relationship between this potential impact and the specific objective of the project, which is to increase the capacity of woody biomass production on selected private and public lands, but also environmental benefits and ecosystem services , including the tons of carbon sequestration which must be captured in the long-term impact assessments.

(a). Restored smallholder forests under the PFMU approach

The preliminary analysis of potential impact carried out in PFMUs (870ha) rehabilitated by the FMBE project shows the ***wood supply capacity (and related generated incomes) from these restored areas should increase by 8 times over the 20 next years (370.000 tons compared to 45.000 in BAU***), which is significantly increasing

[9] Terminology : Impact = General Objective ; Outcome = Specific Objective; Outputs = Expected Result

the financial return from the forestry activities (improving the resilience of small holder farmers to the climate change impact) while securing their access to affordable and sustainable source of clean and renewable cooking fuelwood. The **Fig.5** highlights the estimated cumulative cash flows from a 1000 hectares of restored PFMUs for a period of next 40 years.

At the same time, the restoration of the forest coverage and standing tree stocks in the very degraded private smallholder forests is immediately leading to the restoration of important forest environmental functionalities related to (1) soil erosion control, (2) water catchment and regulation, (3) improvement of soil fertility and (4) the CO2 sequestration. With a projected productivity increase from the average of 2.3 to 13 m3/ha/year and the sustainable management practices set in place, the 870 ha of small holder forest which have been restored should increase the standing wood stocks and related ***cumulative carbon sequestration by almost 10 times over the next 20 years (1.078.569 tons of CO2 compared to only 174.597 tons in business as usual-BAU)*** as shown in **Fig.6.**

Figure 5 : Projected cash flows associated with rehabilitated smallholder forests compared to the business as usual in future 40 years

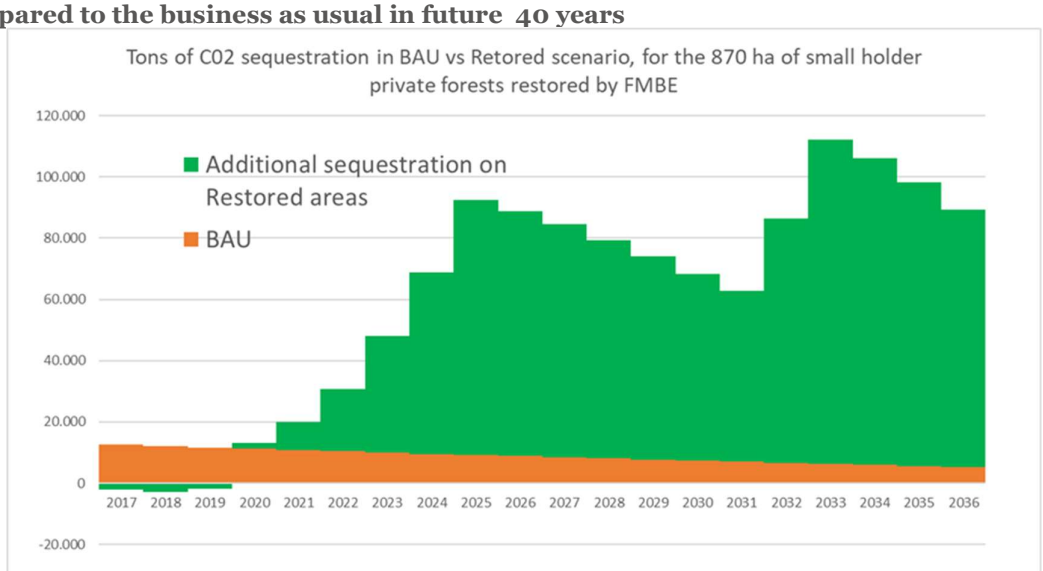


Figure 6: Projected impact of carbon sequestration in PFMUs restored under FMBE project support

(b). Restored agroforestry lands

Similarly, the analysis carried out on restored agroforestry landscapes indicate a projected increase of profitability and attractive financial cash flow over the years for the beneficiary farmers.

The table and graphic below compare the assumed average theoretical 1 ha of land restore under agroforestry (121 tree/ha with 10% fruit trees) and 1 ha of BAU crop land (21 trees/ha).

	1 ha Agroforestry - BAU				1 ha Agroforestry restored			
Financial analysis (US $)	Over 6 years	Over 10 years	Over 20 years	Over 40 years	Over 6 years	Over 10 years	Over 20 years	Over 40 years
DR	13%	13%	13%	13%	13%	13%	13%	13%
NPV	1.602,57	2.121,79	2.632,84	2.778,57	1.819,77	2.727,38	3.812,44	4.229,23
Benefit to cost ratio	4,14	4,05	3,90	3,81	3,96	4,25	4,43	4,49
Net cash flow (DR=0%) - cumul/ha/year	398	384	348	283	474	540	610	647
Net cash flow (DR=0%) - cumul/year per pers-day of man-power	4,4	4,3	3,9	3,1	5,3	6,0	6,8	7,2
NPV/ha/year	267	212	132	69	303	273	191	106
NPV/pers-day/year	3,0	2,4	1,5	0,8	3,4	3,0	2,1	1,2

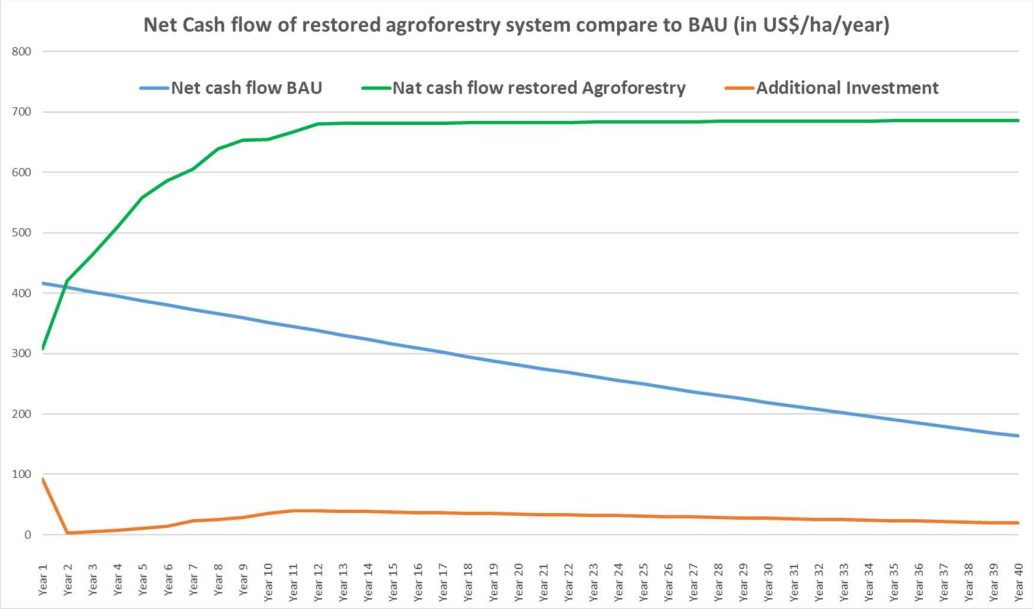


Figure 7: Estimated financial returns from one hectare of agroforestry land planted with at least 100 trees compared to Business as Usual (baseline of 25trees per ha).

The above graphs show clearly that the profitability of the BAU crop land will decrease continuously due to soil erosion and fertility loss with a net cash flow per pers-day of farmer labour which would fall from 4.4 US$ to 3.1 (equivalent to 283 US$/ha/year), while the restored agroforestry system will increase the overall profitability to reach 7.2 US$ per farmer labour day (equivalent to around 647 US$/ha/year).

Also, the cost equivalent of the fuelwood collection time saving is representing around 22% of the calculated additional cash flow of HHs, which is very significant and demonstrating the socio-economic impact of this fuel wood collection affecting the most vulnerable HH not having access to their owned wood resource.

Looking at the financial analysis of agroforestry landscape restoration, and taking into account additional labour investment of the farmer for maintenance, all the parameters are positive (IRR from 58% to 72%, cost/benefit from 3,08 to 7.55) with a payback period of only 4 years.

With 100 trees planted on one hectare of crop lands, the potential impact in carbon sequestration will also more than triple over the next 20 years as shown in the **Fig. 8.**

Though the projected impact couldn't be achieved in the lifespan of FMBE project, their probability of occurrence and sustainability are assured, especially that all the FMBE approaches are stipulated in the FSSP and within the 7 years Government Plan (NST1), it is likely to achieve the projected impact in the near future.

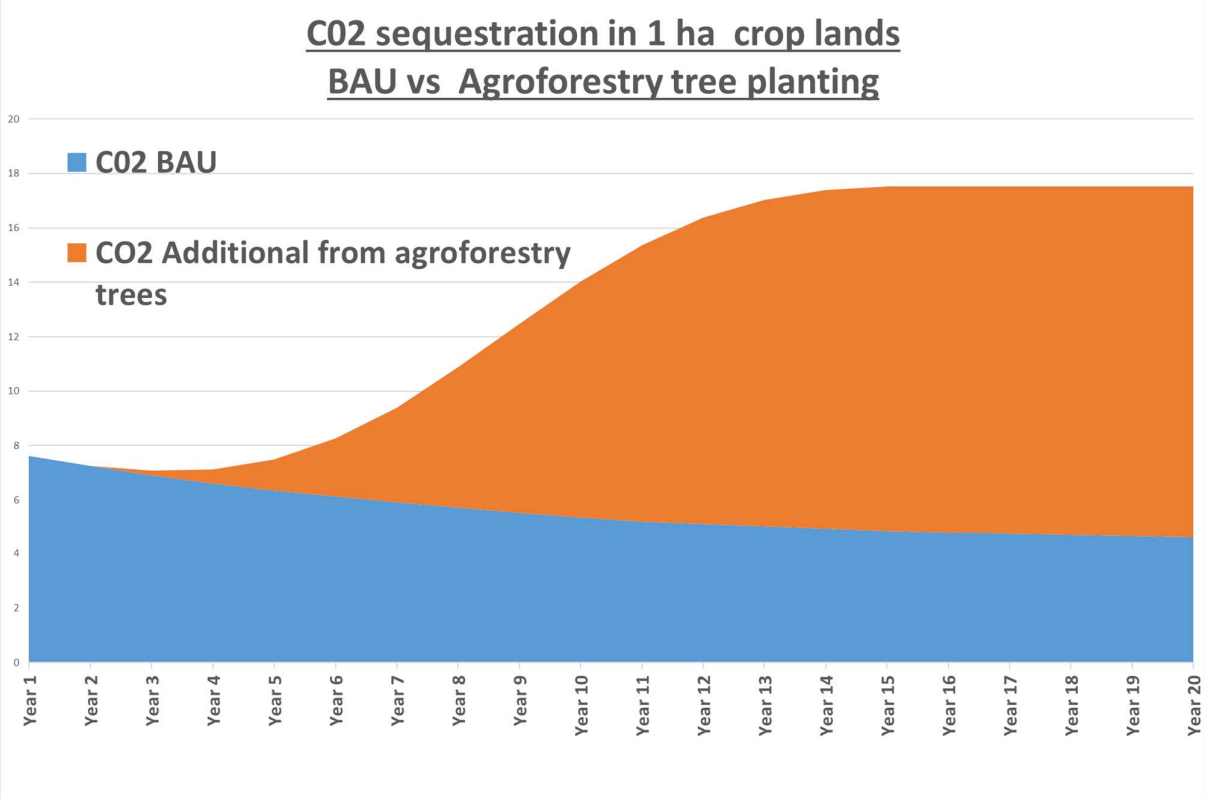


Figure 8: CO2 sequestration potential on 1 ha of Agroforestry land restored with project investments (at least 100 trees planted per ha, compared to Business as Usual baseline of 25 trees per ha).

2.2.2 To what extent has the outcome been achieved? Explain

Over 5 years duration, the FMBE project focused on piloting innovative approaches towards better management of forests, with the ultimate aim to boost production and productivity for both public forests (through concessional Public-Private Partnerships) and private forests (through better management in cooperatives and PFMUs).

In the first year of the project, a baseline inventory for public forests (state and district forests) were conducted as preliminary step to developing DFMPs for Rwamagana, Gasabo, Kicukiro and Nyarugenge districts. Detailed inventories for DFMPs of the 3 districts in North (Gakenke, Rulindo and Gicumbi) were already carried out in 2016 with the previous intervention (PAREF Be2) . These inventories confirmed the findings of the 2015 NFI which had revealed that overall the public and private forests are poorly stocked and hence low productivity: Across all the 7 districts of intervention, the average wood stock of district managed forests varied between 16 m^3/ha (Rwamagana, Gasabo) to 39 m^3/ha (Gakenke). These

Figure 9: An example of Orthophoto / 2009 of Fumbwe site with very degraded forest cover before restoration through PFMU

averages were far below the expected standards between 70- 100 m^3/ha. The state forests, though they showed better off stock compared to district managed forests, they were also far from expected standards (120-180 m^3/ha). Average of wood stock in state forests varied from 47 m^3/ha (Rwamagana) to 80 m^3/ha (Gakenke).

The individual private owned forests were worse off , with average wood stock of 13 m^3/ha (Rwamagana) and 22 m^3/ha (in Gakenke) while the expectations should be between 70 to 100 m^3/ha.

Across all districts of intervention, while many (more than 70%) of the public forests are over matured (beyond 30 years old), many of the private owned forests are on the contrary regenerations from very old stumps which are cut every 2-3 years.

The FMBE project approaches were hence directed to reverting this current situation of both public and private forests. The productivity of reconverted smallholder forests (870ha) under the PFMU approach is expected to triple, from the average of 5m^3/ha/yr to 15m^3/ha/yr.

Similarly, the planting of agroforestry lands (3,494ha) was done through another innovative approach of involving Village Lead farmers and FFS facilitators at cell level who had been trained to accompany the individual farmers in crop production, and a module of agroforestry practices was added to their training package. This had a positive effect right from the planting, with tree survival rate over 90% , which would have been difficult without this extension system.

Also, survival rate of trees planted along roadsides has been outstanding (over 86%) across all districts of intervention mainly due to the introduction of Community Vigilance Committees.

Figure 10: Illustration of well growing wood stocks in the smallholder forests reconvereted under PFMU approach. Case of Fumbwe PFMU, Rwamagana District.

Figure 11: Illustration of Capacity building of FFS facilitators on Agroforestry practices

2.2.3 To what extent have outputs been achieved? Explain

(a). DFMPs development and implementation

The expected Result1 (Output1) of the project concerned the development and implementation of DFMPs. The first year of the project was dedicated to cadastral mapping as well as quantitative and qualitative assessments of the public forests in 4 districts where DFMPs had to be developed (Rwamagana and 3 Kigali City districts). The version1 of the DFMPs have been developed and validated in June 2018.

In the second and third years of project implementation (2018/2019 and 2019/2020), the project focused on smallholder forests rehabilitation, as well as agroforestry and roadsides identification and planting. In the first planting season (2018/2019) about 267 ha of private forests have been rehabilitated in consolidated manner, sensitizing the private owners to form cooperatives. In this first planting season, 8 PFMUs have were established across the 4 districts. The planting was also done on 370.59km of roadsides and community

vigilance committees were established at every 5 km. Another piloted approach was the use FFS facilitators and Twigire Muhinzi Agro -promotors in planting agroforestry trees on consolidated blocks of 1262 ha.

In the third year of the project (and second season of planting), the project doubled its targets mainly due to the top-up financing acquired from Brussels Capital Region to scale up climate related adaptation and mitigation activities. In this reporting period, 606 hectares of private woodlots were rehabilitated through the PFMU approach, making a cumulative total of 870 hectares of degraded private forests rehabilitated (with 394.6ha added due to RBC funds).

Also within the objective of increasing tree resources in crop lands as well as their sustainable management through FFS approach, a total of 2,232 hectares of crop lands were planted with trees on average of 100 trees /ha. A total of 228,644 conventional trees, and 17,123 fruit trees were planted. This made the cumulative total of 3,494 hectares of Agroforestry established in consolidated manner of big blocks of 150hectares and more. Out of these, all the 2,232hectares planted in the season 2019/2020 were funded under RBC.

Increasing tree density on roadsides/ riversides and lakeshore, as well as mechanisms for their survival, maintenance and sustainable management were also scaled up, with additional 360 km(ha) planted in 2019/2020 season, making a cumulative total of 730 km(ha) planted by the project, on average of 600 trees / km on roadsides and 1200 trees/ha on lakeshore.

Overall, the activities planned under output1 have been achieved according to the plan, with on field outputs doubled due to the top-u financing acquired from Brussels Capital Region (RBC). The total quantities of hectares planted by the project are summarized in **Table1**, while comparison to initial plan is highlighted under **Table2.**

Table 2 : Cumulative hectares of forests ,crop lands and plantations on roadsides realized with the financing of FMBE project and To-up of RBC

Total Quantities of Ha planted through FMBE (+RBC top-up)	3 Kigali	Rwamagana		Rulindo		Gakenke		Gicumbi		Total per type	RBC Top-Up Contributions (About 50%)
	FMBE	FMBE	RBC	FMBE	RBC	FMBE	RBC	FMBE	RBC		
Afforestation/conversion public lar	-	50.00	-	-	-	-	-	-	-	**50.00**	**-**
Roadside /river side/ Lake shore plantations km (ha)	400.00	51.40	40.00	85.70	-	90.84	-	62.70	-	**730.64**	**40.00**
Private FMU -ha	-	192.89	164.60	131.38	65.00	100.46	65.00	51.03	100.00	**870.36**	**394.60**
Agroforestry - ha	-	1,262.00	1,160.21	-	522.00	-	550.00	-	-	**3,494.21**	**2,232.21**
Subtotal plantation	400.00	294.28	204.60	217.08	65.00	191.30	65.00	113.73	100.00	**1,651.00**	**434.60**
Subtotal Agroforestry	-	1,262.00	1,160.21	-	522.00	-	550.00	-	-	**3,494.21**	**2,232.21**
GRAND TOTAL FOR TWO PLANTING SEASONS	**400.00**	**1,556.28**	**1,364.81**	**217.08**	**587.00**	**191.30**	**615.00**	**113.73**	**100.00**	**5,145.21**	**2,666.81**

Table 3 : Comparison of Initial planning versus achievements in terms of plantations under FMBE project

Initial Planning versus Achievements			
	Planned	**Achieved**	**% achievement**
Plantations (Public lands)	550	50	9%
Private forests rehabilitated through PFMU approach (Ha)	375	870	232%
Roadsides / riversides (Km/ha)	250	730	292%
Agroforestry (Ha)	1200	3494	291%
Total	**2375**	**5144**	**217%**

As explained in the Monitoring matrix above in Table1, while it was initially planned to plant about 550 hectares of public lands and only do a smaller piloting of the PFMU approach, the project steering committee approved the idea of rather expanding the PFMU approach and let the public areas to be afforested through concessions with the Private operators.

(b). Improved capacity of RFA and districts.

Regarding the expected result2 of the project which was related to capacity enhancement for RFA staff at central level and District staff (through continuous technical support, advising, mentoring and setting up enabling mechanisms including the monitoring of forests management , and financing opportunities), the project supported :

- The development of an integrated web-based FMES and DFMP Database system which should be anchored at each district with all the information regarding different types of forests and management regimes within the district. This FMES/DFMP[10] system will feed information and data into the national RBM&E (Result-Based Monitoring and Evaluation) already designed for the monitoring , reporting and coordination of all the subsectors of the natural resources and environment sector.

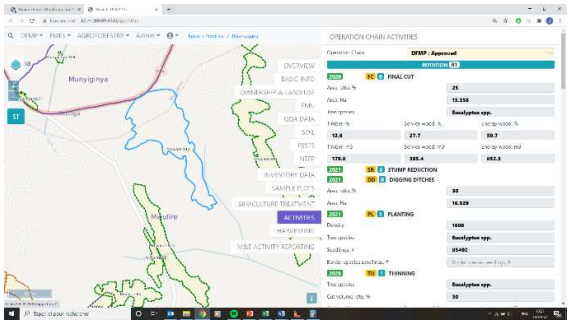


Figure 12: Integrated Web-based FMES/DFMP - Forests Monitoring& Evaluation tool

- Several trainings on the use of FMES/DFMP software have been conducted , with 14 Master Trainers and roll out trainings to all 30 District Forest Officers and Forest Extensionists at sector levels.
- Provision of a 2 years Technical Assistance to RWFA's Tree Seed Unit staff based in Huye: A consulting expert in Tree Seeds development was hired by FMBE from January 2018 until October 2019. The contract for this consultant was for 7 intermittent field missions totalling 240 work-days. The main focus was on development of 15 training manuals as well as on -job trainings for the different themes pertaining to seed sourcing, seeds orchard establishment and management, seed stock management, seed supply management system, seeds certification , etc…

Figure 13: Consulting expert in Tree reproductive materials conducting on- job training for the Tree Seed Centre staff at Huye.

[10] FMES (Forest Monitoring and Evaluation system) was developed in 2015/2016 with PAREF Be2 funding. Although the RWFA teams at central level and district officers were trained on its use, it has not been yet fully used. The users reported that there are some dysfunctionalities which FMBE had committed to address. However given that this FMES was developed before the development DFMPs, it became evident that the FMES system could not integrate all data required to monitor DFMP implementation. This is why the project decided to launch a new tender to develop a new version of FMES integrated with DFMP database as one system

- Financial and technical support in updating the National Forest Cover map: in collaboration with IUCN, a new National Forest Cover mapping was completed in 2019 based on World View satellite images of 30cm resolution. The final report was published in November 2019, and revealed that, as of 2019, forests of Rwanda occupy about 724,695 hectares of total country land (30.4%) of which 387,425 hectares (53.5%) are plantations and 130,850 hectares (18.1%) are natural mountain forests, while 161,843ha are wooded savannah (22.3%) mainly abundant in the Eastern Province, together with shrubs which occupy 43,963ha (6.1%).

Beside the support in systems setting, the FMBE has constantly worked on funds mobilization for the accrued financing of the forestry sector and climate change mitigation and adaptation, in addition to the 0.5M top-up financing acquired in July 2017 from Region Brussels Capital:

- In 2019, the project team worked on an Agroforestry research proposal submitted to EU-DEVCO for funding under DeSIRA program. This application for funding was developed in collaboration with IUCN Rwanda . The title of DeSIRA submitted proposal reads as follows: **"*Improving resilience of farmers' livelihoods to climate change through innovative, research proven climate-smart agroforestry and efficient use of tree resources in the Eastern Province and peri-urban areas of Kigali city"***. A 4 M EUR funding was approved by EU for this action- research in December 2019, with 2M being managed by Enabel and 2M for IUCN.
- From 2017, FMBE team in collaboration with IUCN and MoE, initiated and led the development of a concept note and subsequent proposal for a 33.7M USD TREPA project (***Transforming Eastern Province of Rwanda's capacity to adapt to climate change through forests and landscapes restoration)*** submitted to GCF for funding**.** The proposal was approved by GCF Board on 01st July 2021, and Enabel was entrusted with 10.7M USD for the upscaling of the PFMU approach on 6,000ha of smallholder forests in Eastern Province, as well as supporting the access to improved cook stoves for about 100,000 households.
- In addition to TREPA -GCF funded project, Enabel/FMBE team also supported the development of a 7.8M EUR complementary community driven biodiversity project which was approved for funding by SIDA, and Enabel will be part of the implementing consortium together with RFA and IUCN.
- In 2018, FMBE team supported extensively the development of a 50 M USD Rwanda Forests Investment Program submitted to Climate Investment (CIF) for funding, and at the time of writing this final report there is good news that a first part of about 17M USD have been approved for funding, mainly focusing on Agroforestry upscaling.
- There are other project concept notes developed by the FMBE team such as the EPAFLEC (***Engaging private sector in climate change adaptation through improved forest management in the North-West of Rwanda for feeding efficient low emission cooking solutions for urban areas*** **),** a concept note submitted to GCF but still under consideration, as well as another concept note jointly developed with GGGI on promoting Nature -Based Solutions towards Urban Floods management, yet to be submitted for a PPF funding from GCF.

Regarding the capitalization and knowledge management of designing, implementation and monitoring of DFMPs and SFMPs, various campaigns have been organized by the project, including the national campaign on Smallholder forests rehabilitation through PFMU approach launched by the Minister of Environment on 31st January 2019 at Rwamagana District, as well as various "Umuganda" Community forests planting campaigns organized on the 26th October 2019 (Rulindo District) and 30th November 2019 (Rwamagana District) , respectively. Both the Belgian Ambassador and Minister of Environment participated in these campaigns.

Figure 14: National Launch of PFMU approach on 31/01/2019 at Rwamagana. L-R: Minister of Environment , Mayor of Rwamagana District , Head of Cooperation at Belgian Embassy, FMBE project Manager and Enabel Resident Representative.

Figure 15: On 30th Nov. 2019, Rwanda Minister of Environment (Dr Jeanne d'Arc Mujawamariya) , and the Belgian Ambassador in Rwanda (Mr Benoit Ryelandt) planting trees during "Umuganda" Community Campaign for Smallholder Forests rehabilitation at Karenge PFMU site, Rwamagana District

2.2.4 To what extent did outputs contribute to the achievement of the outcome

The project expected outcome was about increased production capacity of wood biomass on selected private and public land in the districts of intervention. With rehabilitated 870 ha of smallholder forests, 730 km/ha of empty roadsides areas planted by the project, plus over 3,400 ha of crop lands enhanced with agroforestry trees on average of 100trees/ha , all associated with established sustainable management system, namely through PFMU cooperatives of forest owners, Community Vigilance Committees at every 5 km of the roadside distance, as well as the involved FFS facilitators for the management of trees in crop lands, it is expected that the wood production and supply from these respective sites will be increased to contribute to the sustainable wood supply in the country.

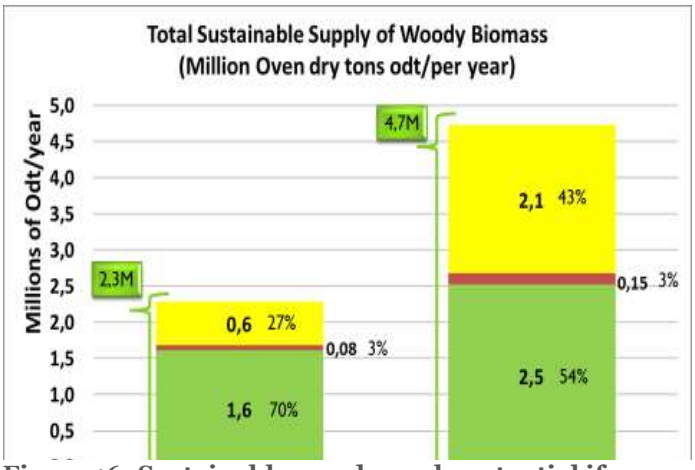


Figure 16: Sustainable wood supply potential if innovative management approaches piloted by FMBE are applied at national scale

As explained extensively in Chapter 1, section of general project context, the 2015 National Forests Inventory, the average productivity of forest plantations across various strata are suboptimal and hence total standing wood stock production can't meet the total demands for wood, leading to a huge gap of supply being met through overexploitation of plantations which are harvested before reaching the maturity age. In 2015, total national demands for wood were estimated at 5.9 M tons of wood, while the sustainable supply (ie harvesting matured forests depending on the forest purpose) was estimated at 2.3M tons , leaving a gap of about 3.6 M tons, which continuously lead over exploitation of unmatured forests and consequent land degradation and desertification.

With the piloted approaches under FMBE project, which are also stipulated in the national Forest Sector Strategic Plan (2018-2023), it is expected that wood supply capacity on well managed forests in plantations would more than double, while leveraging the agroforestry crop lands would triple the supply capacity of those areas as highlighted in Fig. 16

Beside the realized plantation targets, given the strategic actions initiated at national level , including the revision of National Forest Policy and development of a 5 years Forest Sector Strategic Plan (2018-2023) , the national Biomass Energy Strategy (BEST) as well as the development of a National Forests Monitoring and Evaluation system (FMES), and mobilized funding opportunities to upscale the piloted initiatives , confidently it can be stated that the expected outcome of the project has been achieved.

2.2.5 Assess the most important influencing factors. What were major issues encountered? How were they addressed by the intervention?[11]

The most important influencing factors of FMBE implementation success can be summarized as follows:

- ***National context and political will / country ownership:*** as explained in details in section 1.1 (Context), with the 2015 NFI the country realized that there is a widening gap between the demands for wood biomass versus the sustainable supply , and every concerned instance , from central ministry level to districts became awakened and concerned. From then, the Ministries in charge (MINIRENA and MINIFRA) are constantly looking for potential ways this biomass dependency can be reduced, with an ambition target of cutting by half the proportion of households depending on firewood, from 79% (in 2017) to 42% in 2024: A special ministerial task force was put in place and meeting regularly

[11] Only mention elements that aren't included 1.1 (Context), if any.

to assess and strategize on the issue. This national context justified the relevance of FMBE project , facilitated its introduction both at national and district levels, as well as commitments and ownership of the Partner Instances from Ministry level, RFA and Districts leadership level.

- ***Piloting a Country-level strategic plan:*** with the above mentioned context, FMBE started amidst the process of revising the NFP and development of FSSP and 10 years NFMP, which Enabel/BTC supported financially through the Study Fund , and technically through PAREF Be2 and then FMBE projects. Both NFP and a 5 years FSSP were approved by Rwanda Cabinet in March 2018. FMBE was hence a blue-print of FSSP 2018-2023 implementation. The project was also directly contributing to the implementation of the 7 years Government plan, NST1.
- ***Direct response to the needs of beneficiaries and Partner:*** while previous national projects had focused on afforestation and rehabilitation of state and districts owned forest lands, FMBE focused on piloting the rehabilitation of private smallholder forest lands which constitute about 70% of the Country Forest Cover. These smallholder forests are the most degraded and most owners can't afford themselves the appropriate rehabilitation costs. The project was hence very much welcomed by the Communities where it intervened.
- ***Precedent PAREF Be work and experience of Enabel/ BTC:*** Previous Belgian funded interventions, PAREF Be1 and B2 had focused on afforestation of public lands as many other projects funded by Development Partners. However, the 2015 NFI initiated and supported through PAREF Be2 showed that prioritization must change, and new strategic actions must be under taken at national level to reverse the issue of sustainable management of forest resources. It is through this PAREF Be2 that the revision of NFP and development of FSSP were initiated and FMBE was developed based on recommendations of PAREF. Also the fact that the International Technical Advisor of the project had been with the previous project (PAREF Be2) , it has smoothen the start of FMBE but also memory transfer , which made that the project made strong strides from its beginning.
- ***Additional top-up funding from RBC :*** With the call for funding for environment and climate change actions, Brussels Capital Region (RBC) has provided 771,150 Eur top-up financing to FMBE activities , which mainly (73% equivalent to 565,000 Eur) focused on upscaling the rehabilitation of smallholder forests through PFMU approach with additional 394ha rehabilitated , and upscaling of Agroforestry plantations to additional 2,232 ha of crop lands planted with agroforestry trees with an average of 100 trees per hectare. The remaining 27% (equivalent to 206,750 Eur) were invested in further development of the integrated web-based FMES/ DFMP software as well as training of users at central and district levels.
- ***Innovative approaches of sustainable management of forestry resources:*** the project has introduced a number of tree resources management approaches which contributed to its success when compared to the previous conventional forestry projects. These approaches included the PFMU Cooperative management approach for the rehabilitation of scattered smallholder forests; the FFS approach to Agroforestry which enhanced, as well as the introduction of community vigilance committees for the management of tree plantations along roadsides, lakes and river shores.
- ***Co-chairing of the Forestry and Biomass thematic working groups:*** the fact that the FMBE intervention manager and ITA were involved in the steering of the Forestry and Biomass TWG as cochair on behalf of other DPs hammered the commitment and striving for strategic changes in these two subsectors , at the same time trying to coordinate and motivate the various actors.

Regarding the major issues encountered, there is not much to mention as major issue apart from:

- ***Very limited budget, time and over pulled human resources of the project versus the huge needs and requests of beneficiaries and the Partner Institutions***: the project was very ambitious in terms of piloting all the various approaches stipulated in the 5 years FSSP (2018-2023), striving to make strategic changes and demonstrating that innovative approaches towards sustainable forests and tree resources management can be possible, and that the situation described in section 1.1 (context) can be

reversed. Hence the project tackled all the angles , from the policy and strategies development at national level , both from the demand and supply sides of wood biomass , with two separate Ministries and attached agencies (MoE and RFA on the Supply side and MININFRA and EDCL on the demand-side); but also introducing changes and creating tangible impact at grassroots levels , including the designs and piloting DFMPs implementation. The project resources were shared in implementing on field activities (including above mentioned afforestation and agroforestry works) but also busy with developing national level systems (FMES/DFMP system and LEAP software system) to capacitate the partner Institutions , and at the same time being busy with the funds mobilization with project proposals as highlighted above in section 2.2.3.b.

- ***Slow uptake of the FMES system and required change of business as usual in the Forestry Monitoring and Evaluation approaches :*** while the FMES/DFMP software system is developed and in place, it is still taking time to bring all the concerned users to change their ordinary practice of reporting through phone calls or quarterly narrative updates of what is happening in forestry sector as district levels, rather than consistently entering the quantitative and qualitative data into the system and being able to generate aggregated reports at national level. This change of business as usual is expected to take time, and to speed up the adoption of new system the Ministry of Environment in collaboration of the Ministry of Local Governance is considering to issue a Ministerial instruction about the system. Another excuse linked with the system adoption is the fact that there is so far a very limited number of GPS -Tablets as on field data collection equipment. So far the project managed to purchase about 45 GPS -tablets used in training staff, and each DFO has got a tablet, however the Forest extensionists at sector level (about 400 of them) haven't yet got the required GPS-Tablets to start feeding information into the system through their daily work on field rather than waiting for specific data collection campaigns.
- ***Slow pace in adopting the Concession approach of public forests:*** while both FSSP (2018-2023) and NST1 (2017-2024) had set targets to reach at least 80% of public forest lands (state and districts managed forests) being conceded to private companies for a better management and committed rehabilitation, by end of 2021 the pace of concessions negotiated was still at 35% which makes unlikely to reach the targets by 2024. The main issue encountered is that many of those public forests are very degraded with very old stamps and there is no attraction of international companies as it requires huge investments for rehabilitation while economic returns are made after a long waiting period. The very few national private companies that manifest an interest (mainly Tea processing companies) also put up a condition of selecting good forest bunches rather than contracting an entire FMU (Forest Management Unit) as demarcated in DFMPs designs. This selective concession will end up leaving behind many state owned degraded lands which at the end will still require public investments for restoration, while these investments should be channeled to restoration of smallholder owned forests whose owners do not have the financial capacity to restore their lands themselves, hence affecting the entire national forest cover maintenance.
- ***Institutional changes and staff turn-over in the coordination of Forestry Sector:*** As highlighted in the section 1.1.2 (Institutional Context), over the last 5 years there have been several institutional changes in the Forestry sector coordination, affecting the project anchorage, changes of Partner Institutions leadership, which in one way or another affected the institutional memory, ambitions and commitments to strategic changes which were being initiated. Every institutional leader had his or her own specific priorities and not necessarily what was agreed with a previous one.

2.2.6 Assess the unexpected results, both negative and positive ones

- ***Increased social capital***: The initiated PFMU approach has led to more social cohesion and associated social benefits**.** The smallholder forests owners who were initially scattered and each one working on his own now are grouped into cooperatives, meeting regularly and discussing not only about their forests productivity as business, but also tackling other social issues such as ensuring that each member has paid for mutual health insurance, access to small group loans through the initiated "tontines"

(informal voluntary savings and credits in groups), etc. This cooperative approach broke the isolation of each and every member. Also, the cooperatives have become a platform where other community development initiatives are discussed and local leaders use these cooperatives to transfer the messages for community social economic aspects.

- The PFMU Cooperatives and FFS groups in Agroforestry show ***the potential to attract private investors and companies involved in wood value chain and processing***: Already the contacts have started with the pellet making company (BioMassters, former Inyenyeri) for the supply of wood row materials for pellets processing, it is expected that other contract farming or supply contracts will be formalized as the rehabilitated forests grow well and faster.

2.2.7 Assess the Integration of Transversal Themes in the intervention strategy

(a) Gender mainstreaming

At the start of the project, in order to draw a gender mainstreaming action plan for the project, an assessment was carried out in 2018 to identify potential gender gaps that must be addressed within the project approaches and guiding documents, but also among the project beneficiaries across the districts of intervention. With the support of a recruited consulting firm (RAD Consult), focus group discussions and individual interviews were organized with the forest management groups/ associations as well as within technical staff.

The identified key gender gaps that the project strived to address included:

1. Lack of gender sensitiveness among the service providers due to limited knowledge about gender and why of gender mainstreaming;
2. Limited level of female access and control to/over land and income compared to male;
3. Deep –rooted traditional patriarchal stereotypes regarding the roles and responsibilities of men and women still persist in Rwanda;
4. Majority of women lack knowledge and skills for traditionally male reserved areas such as forest management;
5. Limited gender sensitive attitude among men who silently resist women from participating in forest management. Forestry management is still seen as a more of the responsibility for a man than a woman.
6. Women still focus more on trees for firewood while men put their focus on trees for economic income (charcoal making etc.), which influences the choice of trees to be planted.
7. Underrepresentation of women in rural cooperatives administration: the leadership/ governance of cooperatives is male dominated.
8. Lack of capacity, skills and self-confidence by women to claim top leadership in cooperatives.

Based on the above areas of actions identified to address the gender gaps in the process of implementing DFMPs, the project continuously organized awareness sessions on field with communities and cooperatives to always take gender into consideration in each activity and decisions being taken. This awareness was also continuously raised with the service providers. Gender equality and representation was also insisted on in FFS groups. Women were sensitized on economic benefits of tree plantation apart from firewood; sensitization of women and men on different laws regulating the family property (like land law of 2013 and succession law of 2016) , etc.

Also to ensure that the service contracts do not remain gender blind, a number of gender mainstreaming actions and penalties in case of inaction were included in the tenders for afforestation and agroforestry planting whereby a proportion (at least 30%) of on field employees must be women, and the on field reporting tools must always be with sex-disaggregated data.

The above actions to make FMBE gender sensitive have been observed and confirmed by the independent Mid Term Review consultants who stated: "*Gender requirements on the percentage of women to be employed and to hold positions of influence are included together with a requirement for equal pay in the project's contracts with service providers as well as in MoUs with cooperatives and community groups. They are also included*

in the draft template for contracts to rehabilitate public forests. Monitoring reports include the level of compliance achieved.

The review team made observations in the field and conducted interviews that included gender issues. The findings from the field visits suggest that in nearly all cases – the exceptions being in groups that are still in process of being formed – these requirements have been met and often exceeded. When the team held group discussions, women participated actively and openly".

(b) Environment and climate change drivers

The FMBE project addressed one of the major drivers of forest degradation in Rwanda – the increasingly unsustainable use of forests for energy production, which leads to desertification and associated climate change effects including droughts (currently observed in the Eastern Province) and floods in the rest of the country. Therefore by improving the forests management on both public lands (through monitored concessions) and improving management and productivity of privately owned forests (through cooperatives and agreed upon management plans); increasing trees on roadsides/ lakes and riversides ; and increasing the number of trees on crop lands and their management through FFS , the project will positively impact on restoration of degraded environment and will influence the climate change mitigation and adaptations mechanisms.

Figure 17: Many of the rehabilitated forests play multiple roles on the very steepy hills , including soil erosion control , water catchment protecion etc... Case of Nyakabanga PFMU (Rulindo District) in catchement areas of Yanze Agricultural Irrigation Dam (photo taken in 2018 at early stage of trees growth)

It is in that regard of mainstreaming environment and climate change that the project was not only involved in forests management only, but also in the holistic coordination of both the demand and supply of biomass energy.

In the perspectives of mainstreaming climate change, the Project acquired a top-up financing from the Brussels Capital Region (RBC) which helped to scale up activities of afforestation, doubling the initial FMBE targets . Also in the same vein, the FMBE has been jointly collaborating with IUCN in updating the National Forest Cover, and in developing a funding proposal submitted to GCF, targeting the forests and holistic landscape restoration in the drought stricken Eastern Province of Rwanda.

3 Sustainability

In this chapter, by answering the questions underneath, interventions need to describe how results achieved will be sustained and whether a specific exit-strategy has been developed in order to guarantee this.

3.1.1 What is the economic and financial viability of the results of the intervention? What are potential risks? What measures were taken?

As indicated and deeply analyzed in section 2.2 (Analysis of results), the smallholder forests rehabilitated through the PFMU approach have the potential to yield 8 times more wood stock compared to the business as usual in the next 20 years , and hence significant increase of financial returns from the forestry activities, improving the resilience of small holder farmers to the climate change impact while securing their access to affordable and sustainable source of clean and renewable cooking fuelwood.

Table 4: Analysis of financial flows (in Euro) for 1ha of restored smallholder forests under PFMU approach, over the next 20 years.

Discount Rate BAU	10,0%		
Discount Rate FMBE	10,0%		
	6 years	**10 years**	**20 years**
NPV BAU	196,61	267,79	343,39
NPV restored without support	-591,71	139,43	563,49
NPV Restored with FMBE support	179,02	910,16	1.334,22

While under the business as usual (BAU), the profitability is estimated at 17 Euro per hectare per year, with the FMBE support the annual profitability is quadripled , estimated at 67 eur/ha/year over the next 20 years.

The only risk that might hinder these economic and financial returns could be the premature harvesting of the trees due to impatience in waiting the 6-7 years rotational plan. Trees optimal maturity takes a long time while the farmers need cash flows all along to be able to cater for their daily economic needs.

3.1.2 What is the level of ownership of the intervention by target groups and will it continue after the end of external support? What are potential risks? What measures were taken?

With these remarkable expected returns, the owners of the forests are very committed to carry out the required forests maintainance activities even after the end of the project.

In order to mitigate the above mentioned potential risks of premature harvesting by individual decision, prior to the start of rehabilitation works, each PFMU cooperative members have made individual commitment to respect the harvesting rotational plan, and each cooperative has signed a Memorandum of Understanding with the District Mayor and RFA Director General with a commitment that these PFMUs are going to be managed according to the agreed upon simplified forests management plan (SFMP).

In the meantime, both the District and RFA are committed to facilitate linkages of the Cooperatives to the potential off takers involved in wood value chains (like Pellet processor BioMasster company) so that they can sign a commercial deal of supplying x tons of wood in a given period. Once these supply contracts are formalized, there could be possibilities of providing proportional advance payments to help the farmers meet their economic needs in the meantime while waiting for harvesting at agreed rotational period.

Similar arrangements of wood supply through cooperatives and potential contract farming are also foreseen in Agroforestry where trees have been increased with an average of 100 trees per hectare. These individual farmers could aggregate their tree harvests through the cooperative of FFS facilitators and cell level or conjugate efforts with the nearby PFMU cooperative to increase the potential supply of wood based on the demands.

The sustainability risk is on the Community Vigilance Committees (CVCs) elected for the safeguard and maintenance of roadside plantations since they should be motivated in one way or another, considering that by law, the planted roadside areas are public lands by principle. The project has advocated that in the new Forest Law to be published soon , some incentives for CVCs be legally recongnized, otherwise the previous law was silent on how the roadside trees are harvested and how the community near by could get a benefit share on these treees, encouraging for their sustainable management.

3.1.3 What was the level of policy support provided and the degree of interaction between intervention and policy level? What are potential risks? What measures were taken?

As stated in the section 1.1 (Project context) , at the policy level, the FMBE project approaches were already anchored in the NFP and FSSP (2018-2023), as well as the NST1 which the project extensively contributed in their development, and the project has been influential not only on the supply side but also on the demands side of wood biomass, with the revision and development of Biomass Energy Strategy (BEST). Based on its relevance to these national policies and strategies as well as the manifested interest and ownership of the Partner Ministry (MoE &RFA) towards the intervention's approaches, especially the PFMU approach which is highly appreciated, there are good signs that the project outputs and intended outcome will continue to be followed up, sustained and scaled up with the future financial support from other Donors.

The only challenge or constraint would have been the funds mobilisation to upscale these approaches, but at least all the new interventions starting are being recommended to use similar approaches of FMBE. For instance, RFA has recommended to use the PFMU approach in the new GEF funded project which is started early 2021 focusing on landscapes restoration in Amayaga Region of Southern Province. There is also a GCF funded, Green Gicumbi project in the North, which is intervening in one of FMBE intervention districts (Gicumbi District) and is already up-taking the FMBE approaches, particularly scaling up the PFMU approach and Agroforestry through FFS approach. At least in this Gicumbi district, it is already assured that farmer groups and cooperatives initiated by FMBE project will continue to be followed up and mentored by this new project.

The recently approved 33.7 M USD GCF funded TREPA project has already the targets to upscale the PFMU approach on over 6000 hectares of smallholder forest lands, as well as upscaling the Agroforestry tree planting through FFS approach on over 40,000 hectares of crop lands in the Eastern Province.

3.1.4 How well has the intervention contributed to institutional and management capacity? What are potential risks? What measures were taken?

The section 2.2.3.b above (Analysis of Output2) highlighted the initiated actions and achievements in building the long term capacity of the Forestry Agency (RFA), including the development and establishment of integrated FMES- DFMP data base software; the update of the National Forest Cover Map; a number of proposals developed with the aim of mobilizing funds for DFMPs implementation, etc…

The potential risks are still on the adoption and consistent use of FMES-DFMP system which requires that all the 30 districts start reporting and capturing all forestry related information through the FMES, and there is still a reluctance as it requires the DFOs to get out the business as usual and collect accurate geographical coordinates of every forest visited on daily basis.

In order to mitigate the potential resistance to change, a Ministerial Instruction Letter was drafted, yet to be signed off by the Minister of Environment and Minister of Local Governance. Also piloting the use of the FMES software is going to be up-taken by the new projects, TREPA and COMBIO, which assures that the invested efforts will not vanish by end of the project.

4 Learning

Lessons Learned and Recommendations

Throughout the Project implementation in these last four years, there are some key observations that and lessons learnt that are relevant to share to Stakeholders and other DPs.

Key lessons learnt and recommendations	Targeted audience
1. **Relevance of DFMP Database and FMES**: Rwanda is currently attracting many private (international) investors in various domains, and there are many international companies that are eager to invest in Rwandan forestry sector. However many complain that they can't access the comprehensive information regarding the current status of public and private forests (area, age, species, wood stock , harvesting regimes etc). The FMBE project supported in designing a DFMP database which should be fed in from each district and information hosted in cloud and could be availed to any person interested. But this system in order to be operational it will require strong commitments from both central and Districts to ensure that district data are consistently entered and monitored for quality check. The project counts on MoE and MINALOC leadership to take measures to institutionalize this system.	MoE and RFA leadership to issue the instructions to District staff , but also to tie the reporting into system with incentives (like performance based earmarked funds disbursement)
2. Concession of Public forests: During the elaboration of Districts Forests Management Plans (DFMPs), public forests (state and districts) have been grouped into Forest Management Units of 150-200ha. These include both good standing forests and poor forest areas that must be reconverted. Many of international and national companies interested are usually interested in good forests with high standing volume of wood stock and the concluded concession and co-management agreements signed so far were always based on the choice of the investor. This will have a high risk of selling out only few good forests and the currently poorly managed forests (which are more) will not attract any investor. The project recommends moving forward to consider the whole FMU boundaries so that the good forests and bad forests that need reconversion can be taken at once and ask the investor to start harvests with good forests while reconverting at the same time the poor managed forests. That way the country will be able to increase and maintain its forestry cover and sustainable productivity.	MoE and RFA technical teams, to ensure that the investors do not only choose the good forests but rather consider the whole FMUs.
3. The potential of Private FMUs and private woodlots owners cooperatives to attract more investors through **contract farming approach**: Although the project efforts in grouping private woodlots into PFMUs were still in pilot phase, some investors- one company involved in pellets (Inyenyeri) and one Timber wood company (East Africa Sawmill) have shown interest to work with the farmers cooperatives (private forest owners) to sign a supply contract. Unfortunately, the locations of their plants are far in West and South, while the project has so far grouped farmers in Eastern-North and East Province. Would there have been other projects scaling up the approach in the rest of the country, this could attract more investors with well-organized value chain systems.	MoE, RFA and Development partners supporting the Forestry sector to draw on the lesson and scale up.

4. Need of public investments in reconverting the private owned woodlots and forest areas: About 70% of the forest cover in Rwanda is made up of privately owned small woodlots (many being less than 0.25ha) and poorly managed with suboptimal production (average of 7 to 15 m^3/ha , while the standard should be up to 70-100 10 m^3/ha). Although in the past all the public investments and bilateral projects focused on afforestation on public lands and management of public forests, the current gap situation between demand and supply of wood biomass will never be bridged if a special attention is not paid on supporting small private owners to reconvert and better manage their forests. This will need enabling environment for them to access financial loans , but also start –up seed capital investments are required for them to get on the long run track.	MoE, RFA and the Development Partners, to assess how proportional investments could be channelled to supporting small private forests owners.
5. Agroforestry has a very high potential of revamping the biomass supply issue, but interventions need to be well regulated to avoid scatterdness and duplication of efforts. In two planting seasons (2018/2019 and 2019/2020) FMBE project managed to plant over 3,300 hectares of crop lands in Rwamagana, Gakenke and Rulindo Districts. The aim was to pilot intensification of trees in crop lands (moving from average of 25 trees to at least 100 trees), as well as their improved planting, maintenance and management techniques through well trained and motivated Farmer Field School Facilitators and Lead Farmers already identified under "Twigire Muhinzi" national crop extension Program. Where the project planted, consolidated blocks of land of 100 to 150 hectares each were fully planted from one end to the other at distance of 10 m x10m between trees, an approach which is very different from distributing trees to farmers and assuming that they will plant and when you go back you can't easily identify the planted sites. Looking at the planted blocks of land in 2018/2019 as the trees are growing up, a dense canopy of trees is identifiable on a considerable block, and it does provide a good opportunity of attracting potential off-takers of tree products , even from the pruning, hence generating income to the farmers. With a consolidated approach also the carbon sequestration is increased. RFA and MoE should instruct other stakeholders supporting with agroforestry tree planting to ensure that they select a considerable consolidated land site , and plant with agreed tree average on appropriate spacing, in a bid to avoid continuous repetition of actions on same sites. This would speed up the national coverage by well orienting the stakeholders for their specific zones to be covered.	MoE, RFA and the Community of Development Partners to harmonize approaches

PART 2: Synthesis of (operational) monitoring

1 Expenses

Exp ort an overview of expenses from FIT (UBW)

FMBE Budget execution March 2022					
Row Labels	**Initial Budget**	**Delta Revised Budget**	**Total Budget**	**Actuals**	**Available**
RWA1509811_A0101	141,000.00	2,251.43	143,251.43	143,251.43	0.00
RWA1509811_A0102	270,000.00	10,253.63	280,253.63	280,253.63	-0.00
RWA1509811_A0103	45,000.00	-2,861.45	42,138.55	42,138.55	-0.00
RWA1509811_A0104	38,000.00	-20,518.94	17,481.06	17,459.62	21.44
RWA1509811_A0106	10,000.00	-1,034.72	8,965.28	8,956.52	8.76
RWA1509811_A0108	18,000.00	-18,000.00	0.00	0.00	0.00
RWA1509811_A0109	204,000.00	28,877.82	232,877.82	232,819.34	58.48
RWA1509811_A0110	510,000.00	-21,852.04	488,147.96	487,297.54	850.42
RWA1509811_A0111	143,735.00	82,850.44	226,585.44	226,581.92	3.52
RWA1509811_A0112	90,200.00	-4,825.29	85,374.71	85,374.71	0.00
RWA1509811_A0113	177,000.00	-5,196.69	171,803.31	171,802.60	0.71
RWA1509811_A0201	55,000.00	103,724.00	158,724.00	158,632.03	91.97
RWA1509811_A0202	90,000.00	-22,048.73	67,951.27	67,951.24	0.03
RWA1509811_A0203	40,000.00	-34,427.61	5,572.39	5,572.00	0.39
RWA1509811_A0204	45,000.00	-21,074.32	23,925.68	23,916.29	9.39
RWA1509811_A0205	120,000.00	215.62	120,215.62	120,215.62	-0.00
RWA1509811_X0101	26,723.00	-26,723.00	0.00	0.00	0.00
RWA1509811_Z0101	126,000.00	30,471.14	156,471.14	156,471.14	0.00
RWA1509811_Z0102	36,795.00	-16,130.34	20,664.66	20,664.66	0.00
RWA1509811_Z0103	239,640.00	30,593.39	270,233.39	270,190.49	42.90
RWA1509811_Z0104	105,000.00	-3,644.53	101,355.47	101,355.47	-0.00
RWA1509811_Z0201	59,172.00	-1,125.91	58,046.09	58,046.50	-0.41
RWA1509811_Z0202	10,000.00	-8,524.69	1,475.31	1,475.31	-0.00
RWA1509811_Z0203	20,000.00	7,199.86	27,199.86	30,099.86	-2,900.00
RWA1509811_Z0204	10,000.00	-10,000.00	0.00	0.00	0.00
RWA1509811_Z0301	140,000.00	-27,170.45	112,829.55	112,757.12	72.43
RWA1509811_Z0302	31,500.00	-3,084.41	28,415.59	28,060.57	355.02
RWA1509811_Z0303	20,000.00	-13,122.92	6,877.08	6,877.08	-0.00
RWA1509811_Z0304	11,707.00	-1,736.13	9,970.87	9,970.87	-0.00
RWA1509811_Z0305	35,000.00	-26,680.89	8,319.11	8,312.00	7.11
RWA1509811_Z0306	4,550.00	-2,310.18	2,239.82	2,081.77	158.05
RWA1509811_Z0307	3,000.00	-2,668.97	331.03	330.28	0.75
RWA1509811_Z0308	1,000.00	-491.68	508.32	496.32	12.00
RWA1509811_Z0309	0.00	139.75	139.75	139.75	0.00
RWA1509811_Z0310	0.00	749.19	749.19	749.31	-0.12
RWA1509811_Z0311	11,978.00	24,971.19	36,949.19	36,948.34	0.85
RWA1509811_Z0401	80,000.00	-30,624.00	49,376.00	49,375.97	0.03
RWA1509811_Z0402	10,000.00	-1,688.83	8,311.17	8,311.16	0.01
RWA1509811_Z0403	12,000.00	-12,000.00	0.00	0.00	0.00
RWA1509811_Z0404	9,000.00	-6,079.78	2,920.22	2,920.22	-0.00
RWA1509811_Z9998	0.00	10,788.16	10,788.16	11,048.93	-260.77
RWA1509811_Z9999	0.00	12,560.81	12,560.81	10,693.22	1,867.59
Grand Total	**3,000,000.00**	**-0.07**	**2,999,999.93**	**2,999,599.38**	**400.55**

2 Disbursement rate of the intervention

Source of financing	Cumulated budget (EUR)	Real cumulated expenses	Cumulated disbursement rate	Comments and remarks
Direct Belgian Contribution	3,000,000	2,999,599.38	99.98%	Budget execution almost at 100%
Contribution of the Partner Country	800,000	In Kind	In kind	5 years project office and equipment at Central and district levels; indirect contributions of DFOs and RFA staff at central level
Other source **Region Bruxelles Capitale**	835,653 (771,750 direct contribution)	771,947.69	100% of direct contributions to Rwanda	RBC top-up in 2 instalments 565,000 &206,750

3 Personnel of the intervention

Personnel (title and name)	Gender (M/F)	Duration of recruitment (start and end dates)
National Personnel put at disposal by the Partner Country		
1. Prime Ngabonziza, DG- RWFA and Chief Budget Manager for FMBE (Co-Gestion)	M	03/02/ 2017 – 31/01/2020
2. Jean Pierre Mugabo, DG-RFA and Chief Budget Manager for FMBE (Co-Gestion)	M	01/02/2020- 30/06/2021
3. Xavier Rwibasira, RWFA-SPIU Coordinator & FMBE Co-Manager (DI)	M	01/11/2018- 31/01/2020
4. Claudien Habimana , Forest program Manager , SPIU/RWFA	M	01/07/2017 -31/12/2020
5. Jean de Dieu Sebahutu, DAF, SPIU/RWFA	M	03/02/2017-31/01/2020

6. Epiphany Uwizeyimana, Accountant, SPIU/RWFA	F	01/02/2017 -30/06/2021
7. Jerome Tuyisingize, Forest Specialist, SPIU/RWFA	M	17/04/2017 – 30/06/2021
8. Muniru Murwanashyaka, Forest Specialist, SPIU/RWFA	M	17/04/2017 – 30/06/2021
9. Ephrem Imanirareba , Forest Specialist, SPIU/RWFA	M	17/04/2017-24/07/2018
10. Jean Claude Hafashimana, Seconded Forest Specialist (RFA)	M	01/01/2019- 30/06/2021
11. Jean Pierre Rudatinya , Seconded Cooperatives Development Specialist	M	01/04/2019-30/06/2021
12. Christelle Umwali , GIS specialist, SPIU/RWFA	F	17/04/2017 – 30/06/2021
13. Anne-Diane Dushime , Secretary to DAF, SPIU/RWFA	F	03/10/2017- 30/06/2018
14. Christine Udahemuka, Secretary to DAF SPIU/RWFA	F	12/11/2018-30/06/2021
15. Innocente Rudasingwa , Procurement Specialist , SPIU/RWFA (Part-time)	F	01/02/2017-31/01/2020
16. Hyacinthe Nisingizwe, Logistics Officer, SPIU/RWFA (Part-time)	F	01/02/2017-31/01/2020
17. Justin Ngarambe, Driver, SPIU/RWFA	M	13/03/2017-30/06/2021
18. Antoine Mudaheranwa , Driver, SPIU/RWFA	M	13/03/2017-30/06/2021
19. Jean Pierre Munyansanga , Driver, SPIU/RWFA	M	04/12/2017-03/12/2018
20. Jean Mary Nsabiyeze, Seconded Driver , RFA	M	01/06/2017-31/05/2018
21. Jean Paul Safari , Seconded Driver, SPIU/RWAFA	M	01/09/2018- 30/06/2021
Personnel, locally recruited by BTC:		
22. Vincent Nsabuwera, Intervention Manager (DELCO)	M	01/02/2017- 30/06/2021
International experts (BTC):		
23. Jacques Peeters , ITA – Forest Expert	M	01/02/2017- 30/06/2021

4 Original Logical Framework from TFF :

	Logical of the intervention	Indicators	Baseline value and Target	Sources of verification	Hypotheses
GO	**General objective:** Improvement of sustainable management of forest resources contributes to poverty reduction, economic growth and environmental protection	Direct Contribution (= consumption X price) of forestry and wood fuel sector to GDP	*Baseline value*: 5% *Target value*: 5%	FMES	
		Profitability and regular income of forest put under improved management (RWF/ha/year)	*Baseline value*: to be determined during Comprehensive Baseline exercise *Target value*: to be determined during Comprehensive Baseline exercise	Specific survey/study to be done in forest where the project will intervene (at the beginning and at the end of the project)	
SO	**Specific objective**: Woody biomass production capacity is increased on selected private and public land in the districts of intervention	Sustainable supply of woody biomass in improved managed forest (m3/ha/year) on X ha private land and YT ha on public land.	*Baseline value*: 5-8m3/ha/year *Target value*: 10-15m3/ha/year	QQA (at beginning and end of project)	Local Government of selected districts is not implicated in illegal cutting and shows support and commitment for increasing woody biomass/forest production

	Logical of the intervention	Indicators	*Baseline value and Target*	Sources of verification	Hypotheses
R 1	Result 1 District Forest Management Development Plans are developed and implemented	Number of districts having a technically validated DFMP	*Baseline value: 3 districts;* *Target value: 7 districts*	- Minutes of technical validation committee and DFMP document;	RNRA staff available for their participation in the development of the 4 DFMP and for the implementation of the 4 DFMPs Selected districts are committed to participate and facilitate in the process of development and implementation of the selected measures and approach by the project based on their available resources Governments commitment to encourage involvement of private sector actors in forest management is maintained Interest present of Private operators willing to operate under long term concession contracts with the state and under the agreements with private FM groups
		Number of public FMUs having a long-term concession contract which is signed with a private partner	*Baseline value: 0;* *Target value: Rulindo: 3; Gakenke: 3; Gicumbi: 3; Rwamagana: 1*	Concession contracts	
		Number of FOAs established around Private FMUs having each a SFMP	*Baseline value: 0 FOAs* *Target value: 15 FOAs*	Founding paper FOAs with SFMP	

		Number of hectares that are converted according SFMP with project support	*BL value: 0* *Target value: 300 ha*	District report	
		Number of FFS groups with agroforestry activities Number of trees planted by members of the FFS/agroforestry groups	*Baseline value: 48 FFS groups with agroforestry activities;* *Target value: 80 'new' FFS groups with agroforestry activities* *Baseline: 0* *Target value: FFS groups planted in total 150.000 trees(in 4 districts).*	Survey under FFS groups	
		Distance of roadside plantation (km) Number of MoUs signed in the district of Rwamagana (on the 40 km roadside plantation realised through the project)	*Baseline value: 0;* *Target value: 40* *Base value: 0* *Target value: X MoUs signed by X village assemblies adjacent to the road stretch (to be determined during Comprehensive Baseline exercise)*	Signed MoUs	

		Number of MoUs upgraded in 3 PAREF districts including benefit sharing	*Baseline : 0 upgraded MoUs;* *Target value: 90 upgraded MoU with 'benefit sharing';*	Signed upgraded MoUs	
		Number of ha of private and public land additional reconverted or with new plantation in 4 districts by project	*Baseline: to be provided by DFMP of Rwamagana District;* *Target value: additional 500 ha with new plantation and/or converted*	District report with survey	
R 2	Result 2: Improved capacity of RNRA and Districts for monitoring forest management, gender integration and benefitting from climate financing opportunities	Upgrading of FMES with integration of new requested indicators by MINIRENA	*baseline: number of present indicators for which reliable data are collected* *Target value: x new indicators suggested by consultant*	FMES	DFNC takes ownership of the tools developed and uses the analyses available from the FMES to improve forest management in Rwanda Available funds through CC related instruments and/or other financial sources (such as for instance philanthropy) provides fair chance for rewarding well elaborated proposals from the districts for financing A quite harmonized approach for developing and implementation of DFMP on the other districts of the country

		Number of proposals submitted through project support for financing by specific donors and/or institutes related to Climate Finance or other Financing	*Baseline value: 0* *Target value: 5 proposals*	Proposals with proof of being submitted	
		Inclusion of gender promotion in tender documents (according gender integration guidelines)	*Baseline: 0 (no tender)* *Target: all tender documents include gender aspects and invite especially individual women entrepreneurs/ women owned enterprises for a bid*	ToR of Tender and monitoring report of execution of tender	
		Data collection templates for M&E requesting sex aggregated information	*Baseline: no template* *Target: 1 template indicating executed gender sensitive actions as planned in annual action plans and linked to DFMP/SFMP,*	Annual report of District on NR/FM and used indicators for reporting; Reporting of Gender Consultant through framework contract	

		At least one communication channel for regular updating on DFMPs (design and implementation)	*Baseline: 0* *Target value: 1*	Communication channel(s) used and number of DFOs aware of channel		
GO	Improvement of sustainable management of forest resources contributes to poverty reduction, economic growth and environmental protection					Estimated Belgian Contribution (Euros)
SO	Woody biomass production capacity is increased on selected private and public land in the districts of intervention.					3 M euro
R 1	Districts Forest Management Plans are developed and implemented					1,605,213
R 2	Improved capacity of RNRA and Districts for monitoring forest management, gender integration and benefitting from climate financing opportunities					350,000
	Activities to achieve Result 1		OUTPUTS		Means	
A 1.1 & A 1.2	Develop DFMP/SFMPs for Rwamagana, Kicukiro, Gasabo and Nyarugenge districts including update forest cover map, establishment forest cadastre, including direct resolution of 'simple' landowner conflicts and Quick Qualitative Assessment (QQA) of each public forest		4 new DFMPs 4 districts with updated forest cover map, forest cadastre, QQA of the public forests Capacity with RNRA and relevant district officers on designing a DFMP, executing and assessing QQAs		Awareness sessions, Trainings & workshops Cadastre/solving conflicts Forest mapping QQA public forests/Forest Inventory Developing user-friendly interface for DFMP planning Local surveys	258,500

A 1.3	Establishment of PPPs for long-term concession contracts for public forests between State/districts and PFOs through support in developing procedures and templates for procurement and management of contracts, creation and establishment of FMGs, simple conflict cases solved, elaboration of MoUs between PFO and FMGs. Provision of technical support and on-the-job training to Districts/DFNC staff and to contractors/operators for monitoring and implementation of developed DFMP/SFMPs	At least 7 districts have each a long term concession contracts for public forest established with PFO's In 4 districts, 12 FMGs established and supported by PFOs, ensuring PFM in concerned FMUs 12 MoUs signed by PFO and FMGs and monitored on execution 4 districts have capacity for facilitating and developing MoUs for PFM, managing a tender and arriving to a long term concession contract for public forest	Workshops on PPP for private forest concession Awareness sessions and on-job technical training and coaching on development PFM for public FMUs Support process for tendering and contracting	93,200
A 1.4	Support sustainable management of private forest through establishment and training of Forest Owners Association/Coop (FOA), supporting QQA and the design of SFMP for their FMU and support reconversion of their FMUs	15 FOA established around PrFMUs of in average 25 ha each (total of 375 ha) SFMPs developed for their PrFMUs Support for the conversion of their old private plots according the SFMP 4 Districts have capacity to support establishment of FOAs /Pr FMU and to support design/ implementation of their SFMP	Training/awareness sessions of District staff / FOAs; QQA and SFMP design Support/Subvention reconversion of FMU	140,313

A 1.5	Support agroforestry / woodlot establishment on private lands through Twigire Muhinzi/FFS extension system and support of production of quality seedlings by FFS groups	In 4 districts, 80 FFS groups (at least 2000 farmers, m&w) perform within the FFS approach for agroforestry under a functional FFS system in which farmers facilitators are the spill for scaling up agroforestry in seedling demand, production and distribution, permanent learning and jointly monitoring. More efficient system of seedling production, distribution and plantation. 80 FFS groups have planted each in average 15 ha with 2130 trees so in total around 1200 ha. 4 districts 80 farmers facilitators are trained who are able to facilitate their FFS group and the groups have tree nurseries for which the provision of seedlings is supported.	Contract for a private operator for ToT /Master trainers (for FFs), support/supervise nursery establishment and management by FFS, coaching planting and joint monitoring of planting. Trainings, workshops, field days, exchange visits, Support establishment of nurseries and distribution seedlings.	85,200
A 1.6	Support roadside plantation and process for establishment and upgrading of MoUs between Farmers Assembly and District/RNRA, including 'benefit sharing' aspect	Rwamagana: pilot of 40 km new plantation along roads and organizational structure established including MoUs signed with Assembly of farmers/villagers playing active role in planting and maintenance; 3 Paref/North Districts: 50 MoUs upgraded including also 'benefit sharing' Capacity with villagers and decentralized government for organization and making agreements which allow sustainable FM on roadside plantation.	Awareness/training sessions, Assemblies with farmers/villages Support planting roadside	28,000

A 1.7	Support forest reconversion and/or establishment of new forest on public/private land, based on priorities of developed DFMP/SFMP	Reconversion/new planting on an equivalent of 550 ha of private/public lands (Rwamagana district)	Nursery establishment and support Reconversion / new planting of public/private lands	231,000
A 1.8	Provision of high quality seed and/or clones (through importation if required) for plantations	30 kg of high quality seed/clones of selected species purchased/imported	Purchase of high quality seed of selected species	55,000
A 1.9 & A 1.10	Coordination, technical support to and capacity building of district and RNRA staff for designing and implementation of DFMPs	3 NTAs supporting the programme: 1 NTA for 3 Kigali Districts, 1 NTA for Rwamagana and 1 NTA for 3 PAREF/North districts for in total 98 months; 1 ATI for technical support for all districts for 34 months	3 NTAs and 1 ATI (81% of total available time of ATI)	714,000
	Activities to achieve Result 2	Outputs	Means	Belgian Contribution
A 2.1	Upgrade the FMES system software, integrating new needs and provide capacity building for administrators, data collectors and users	Upgraded adapted user-friendly FMES software system which can be managed by RNRA administrators, allowing integration of new requested indicators (such as for Climate Change Fund, etc..) Data collectors ensure adequate data feeding of the system and users can use efficiently the information.	Contract with Consultant Training/coaching and supervision for administrators, data collectors, users Supportive equipment	55,000

A 2.2	Build capacity and provide support to RNRA and staff and private actors of the intervention Districts to develop proposals for obtaining finance through FONERWA or other possible funding mechanisms and be able to do the required Measuring, Reporting and Verification (MRV)	At least in 4 'new' districts (Gas., Kic., Nya. and Rw.) proposals for financing components of the DFMP are submitted and support is given to 'old' districts that have identified components eligible for financing and for which proposals are prepared. Capacity strengthened at district and national level for preparing quality project proposals MRV capacity strengthened	Framework contract with international and national consultant	90,000
A 2.3	Support gender equality and gender mainstreaming in project related aspects of DFMP/ woody biomass sector/PFM	Gender integration and accountability in the development and implementation of the DFMPs/SFMPs; Gender integration in M&E mechanisms at national and decentralized level. Increased participation of women in the forestry sector resulting in increased benefits for them.	Framework contract	40,000
A 2.4	Capitalization and knowledge management for development, implementation and monitoring of DFMPs & SFMPs and other related aspects to PFM	Capacity of MINIRENA/RNRA strengthened in coordinating and supporting the design and implementation of DFMPs; Scaling-up of DFMPs implementation to all other districts in the country supported by availability and dissemination of developed guidelines and templates as well by the sharing of 'lessons learned'.	Workshop/training, newsletter and website/communication channels	45,000
A 2.5	Technical advice and support for coordination of monitoring and capacity building	Strengthened capacity at national level for the monitoring forest management, gender integration and capitalisation.	ITA 8 months (19% of total time)	120,000
	General means (Personnel costs, Investments, Operational costs, Audit, M&E and Backstopping)			994,693
	Contingency			*50,095*

5 Complete Monitoring Matrix

Include the last (full) version of the monitoring matrix

Cfr Section 2.1 above

6 Tools and products

Annex1: Project documentary

https://www.youtube.com/watch?v=rWVjUH_GCJM

Annex2. Technical Note on PFMU Approach

REPUBLIC OF RWANDA

Rwanda Forestry Authority

FMBE

Forest Management and Woody Biomass Energy Support Project

Enabel

TECHNICAL NOTE ON PFMU APPROACH

I. INTRODUCTION

1.1. Relevance of this technical note

This technical note describes PFMU approach as it has been implemented by FMBE Support Project, its conditions of success, and lessons learnt. It is also designed to serve as technical guide to anyone who wish to implement the same approach. Note that this PFMU approach is a best way of guaranteeing sustainable management of private forest plantations in Rwanda.

1.2. Situation of forests in Rwanda

Forests occupy about 724,695 hectares of the total country land (30.4%) of which 387,425 hectares (53.5%) are plantations, 130,850 hectares (18.1%) are natural mountain rainforests, 161,843 hectares are wooded Savannah (22.3%), and 43,963 ha are shrubs (6.1%)[12].

The forest stock is very low with an average of 50m³/ha, while the productivity expressed in terms of mean annual increment (MAI) is very low 8.66m³/ha/year with a very low density of 145 trees/ ha[13]. (MINIRENA, 2015).

It is predicted that wood demand will reach 12 million in 2030 from 7 MT (Millions of tons) in 2015 whilst the sustainable supply of wood product will decrease from 2.5 MT in 2015 to 0.5 MT in 2030 in a business as the usual situation (BAU)[2]

1.3. Situation of private forest plantations

According to 2015 National Forest Inventory report, around **68 %** of non-protected forest plantations of Rwanda are owned by privates and many are poorly managed and overexploited (stem cut every 2-3 years in average) with a very low standing stock (17 m3/ha vs a standard of around 60-80 m3/ha as stipulated in the National Forest Inventory of 2015) and a productivity 2-3 times less than the ideal average standard of 12 m3/ha/year.

The lack of organisation of these forest growers working each individually on their very small size parcel is limiting their performance and their joint knowledge and investment sharing opportunities.

In consequence, these private forest are only producing around 0,8 Million of m3/year, while they should provide at least 2M m3 per year. This is increasing drastically the high gap between the national supply and demand of wood and the correlated over-exploitation of tree resources, which is the main driver of the forest degradation. On top of that, this poor productivity leads to poor profitability of these woodlots, finally convincing farmers to shift their land to crop production or other uses.

1.4. Political will for improving forests management

To respond to the poor management of forests in Rwanda and to legally reinforce productivity and sustainability of forest plantations, the Government has reviewed forestry documents. These include Rwanda National Forest Policy (NFP) and 5 years Forest Sector Strategic Plan (FSSP) approved by the Cabinet in March 2018, Forest Law (FL) under review process. It is also remarkable that the National Strategy for Transformation (NST1) highlighted the percentage of private forests (smallholders) converted into productive forests and managed by Forest Owners Associations (Cooperatives) to increase from 0% to 50% by 2024 among key indicator of the forestry sector to support the green economic and social development in Rwanda. In the same way the Forest Management and Wood Biomass Energy Support Project (FMBE) was conceived and started initiating new approaches to boost the productivity of both public and private forest plantations, Agroforestry, Roadside/ Lakeshore/ Riverside plantations to be able to bridge the widening gap in supply and demand of wood biomass.

1.5. FMBE project Support Project

FMBE (Forest Management and Woody Biomass Support Project) is a Belgian funded Intervention (RWA1509811), whose financing agreement was signed on 20th December 2016 and planned to end with 20th June 2021 (ie 4.5 years of duration). The project was implemented jointly by the Belgian Development Agency (Enabel) and Rwanda Water and Forestry Authority (RWFA) changed into Rwanda Forestry Authority (RFA) under the Ministry of Environment (MoE).

The FMBE project was conceived, following another 8 years Belgian funded intervention (PAREF Be1&2– Programme d'Appui à la Reforestation au Rwanda) which had started in 2008

[12] National forest cover (NFC) 2019
[2] Forest Investment Programme (FIP) 2017

and ended on 05th December 2016. This PAREF program significantly contributed in planting trees on over 8000 ha, mainly focusing on public lands that needed afforestation and reforestation, as well as increasing tree density in crop lands (Agroforestry). Towards the end of PAREF program in 2015, a National Forest Inventory (NFI) was commissioned and revealed that majority of forest plantations are seriously degraded and the productivity was suboptimal, especially the private smallholder forests, while the demand for wood biomass for cooking energy continues to rise up as the population increases. The main objective of the FMBE project is therefore to pilot strategic actions and innovative approaches that must be undertaken and abided on by all stakeholders in the Forestry Sector in order to ensure the sustainable management of the forest resources in different categories. The key content of FMBE intervention includes among others 1)*Sustainable management of the public forests through concessions to private operators; 2)Approaches of promoting sustainable management in private woodlots through Cooperative engagement of owners (PFMUs); 3)Sustainable management of roadsides/riversides/lakeshore plantations through establishment of community vigilance committees (VGCs); 4)Valuation and sustainable management of trees in crop lands (Agroforestry) using the Farmer Field Schools (FFS) extension approaches.*

II. PROCESS OF PFMU CREATION

2.1. Definition of PFMU

A PFMU (private forest management unit) is a group of small private forests with a minimum area to be managed economically and sustainably (from 10ha to more) and which are located on the same hill or on more neighbouring hills.

A PFMU is subdivided into Management Blocs corresponding to the number of coppice rotations. The simplified Forest Management plan of the PFMU determines how various management blocks will be successively harvested. One block includes then parcels with trees to be harvested in the same year.

Key steps toward sustainable management of private forests

-Identification of potential areas of private forest management unity (PFMU)
-Awareness and extension campaign
- Registration of smallholder who accepted to join themselves into cooperative and election of cooperative committees
-Mapping of PFMU site and production of maps
-Elaboration of cooperative legal documents and registration
-Elaboration and signature of MoU
-Training of cooperative members (tree nursery, forest establishment, cooperative governance)
-Conduct reforestation activities jointly between cooperative and Forest service provider(FSP)
-Evaluation and acceptance of reforestation works
-Design, elaboration and signature of Simplified Forest Management Plan (SFMP)
-Training of cooperative members (forest management, harvesting, tree value chain, business plan and cooperative financial management)
-Handover of reforested PFMUs to the owners
-Implementation of SFMP

2.2. Identification of potential areas for PFMU

Potential areas for PFMUs are areas fully owned by smallholder farmers whose forests are very degraded

Orthophoto / 2009 of Fumbwe site before PFMU

2.3. Awareness and extension campaign

Series of meetings allow extension team (experienced staff from project, RFA and district) to met several times with local farmers whose woodlots located in identified potential areas for PFMUs to explain to them how new PFMU approach work, importance of joining themselves into cooperative and advantages of sustainable management of their degraded forests. The extension campaign is also a way of having common understanding on some technical aspects such as the schedule of the various reforestation activities, species to be planted according to the site conditions, expected use of forest products at harvesting time, planting density, and the role of forest Owners in seedlings production, in reforestation activities and in management of PFMU.

Photo, Community mobilization at Rutenderi, Gakenke District, 2019

These meetings offer an opportunity of deciding on appropriate solution to the issues related to the new management approach such as:

- How to supply fuel wood and money to respond to different needs during the management period of PFMU (between the rehabilitation and the harvesting period)?
- Will not rehabilitated forest ownership fall to the government?
- Does the landowner have the right to cede his land and forest in PFMU by sale, donation, inheritance or bank guarantee?
- Will the harvest products belong to the Landowner or to the cooperative?
- How the cooperative managing the PFMU can be trusted while there are some cooperative Leaders who had been accused a mismanagement of their cooperative' property?

2.4. Foundation of cooperative and election of Leaders

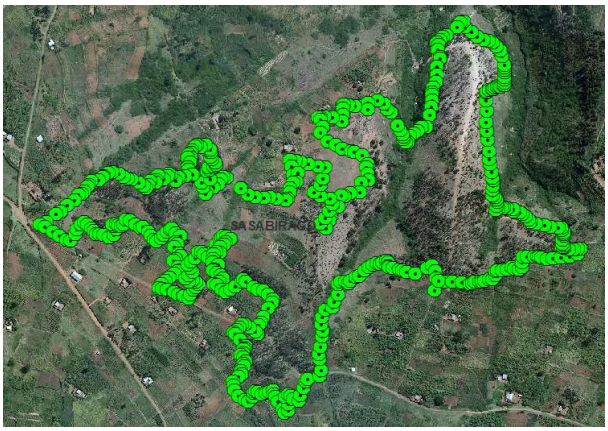
After mobilization, local farmers willing to form cooperative and commit their forest land under PFMU, register on the list of forest owners and elect from them two cooperative committees: Administrative committee made of 5 persons (President, Vice president, Secretary and two Advisors). Supervisory committee made of 3 persons (President, vice president and secretary). Note than gender consideration is mandatory (at least 30% women).

Photo, Election of cooperative committee Members at Murambi, Rulindo District,2019

When the cooperative committees are elected, they are mandated to represent forest land Owners at different events and fulfilling their interests especially in seeking the best market for their forest products and seeking other income-generating opportunities. They are also responsible for the respect of PFMU management tools.

2.5. Mapping PFMU site

Mapping PFMU site consists of marking waypoints of consolidated area of about at least 25 Ha of private smallholder farmers who committed to join cooperative of forest owners. The waypoints taken are used to produce a map. This is the important activity because it serves as the foundation to plan all field activities.



Orthophoto / 2009 of Fumbwe site with demarcation of site to be reforested as PFMU

2.6. Elaboration of cooperative legal documents

With the help of cooperative officer at sector level and the technical guidance of project specialist, cooperative members elaborate cooperative document required for registration. Project specialist ensure clear integration of sustainable forest management parameters and benefit sharing in closes of cooperative's internal laws and regulations.

2.7. Elaboration and signature of MoUs

In order to ensure smooth implementation of PFMU approach, strong commitment of different institutions and local farmers have to be translated in written document duly signed and stumped by concerned parties. The MoU is designed between cooperative of forest owners (CFO), district where PFMU is located and government institution in charge of forestry (RFA). Duties and responsibility committed by each party are clearly stated in MoU. See Annex 1.

2.8. Training of cooperative members

The first training consists of 5 days of training (2 days of theory and 3 days of practice). Training mostly talk about tree seedlings production (nursery construction, sawing, mulching, watering, pricking out, sorting, hardening –off and transportation), forest establishment (site-cleaning, lining out, pegging erosion structures and pits, digging trenches, pitting, refilling, planting, beating up and weeding) and cooperative governance to let them know responsibility and process of everyone in the cooperative.
The first training is essential because it increases the ability of cooperative members to monitor the work of FSP in their plots while FSP find local skilled manpower to work with thus high involvement and quality assurance.

The second training of cooperative members is to be scheduled after final reception because the contract of FSP had been ended and forest owners have to fully take in hands all management practices of their forests. The 5 days' trainings of cooperative members about silvicultural treatment, sustainable forest management, harvesting, tree value chain and cooperative business plan as well as cooperative financial management have to be delivered by experts in domain. These trainings allow cooperative members to implement all activities planned in SFMPs with reduced challenges and think about alternative projects to support their forests. As the success of cooperatives depend on their leaders, but it is of great advantages if all cooperative members know their rights as member to be able to hold their leaders accountable.

Photo, Training on Cooperative management & Audit (Rwamagana Distirct 2020)

2.9. Conduct reforestation activities

The reforestation activities are executed by qualified Private Operators (FSP). Their recruitment should follow procurement process with emphasize on technical competences.

Recruitment of Forest service provider(FSP) is the first step of reforestation activities. *The FSP should be experienced firm with enough resources (financial, human, logistics). Terms of references (ToR) must reflect above qualities. The tender document should be detailed enough to all bidders to submit more detailed technical proposals which should be part of contract when the successful bidder will be selected. FSP has to put in place well experienced technicians with professional attitude because the success for this approach depend not only to skills and knowledge, but also to the ability to work with local farmers and to be trusted by them.*

Reforestation activities have to be done through full involvement of forest owners and the last one remains the priority in recruitment of local man powers (skilled and non-skilled).

A tight monitoring should be regularly done to ensure that reforestation activities are executed according to the specifications from contracting documents.

2.10. Site preparation

Bush clearing

Bush clearing in PFMU sites consist of two operations:

-Harvesting of existing stock: cutting and removal of existing tree is done by forest owners. Attention should be paid to the proper timing of this operation because its delay may affect other successor operations

-Clearing bush: cutting bushes in PFMUs is the task of FSP. In some cases, where invasive species like *Lantana camara* are invaded, it is advised to uproot their stumps because they sprout quickly, grow faster and tend to over crown new seedlings to be planted. It is advised to use cleaned bush for other used (mulch and/ or humus) but when there are thorn plants, it is better to remove them from the site and damp them in small area nearby site to avoid accident. Note that neither burning nor herbicides are not allowed (Environmental law)

The project promoted debarking of existing stumps rather than uprooting because the first one is cost effective, avoid soil erosion & landslide on loose and steep soil as well as reduction of exportation (fertilisation law)

Pegging, ditching, pitting

Pegging and digging in PFMUs consisted of three operations:

Pegging contour lines: contour lining was done by starting from thalweg, 300 dug linear meters per ha were executed. Distance between two contour lines were estimated based on specific slope of the part of the site and was valued between 20-40m.

Photo, Erosion control ditches created following contour lines (Rutenderi, Gakenke District)

Pegging and excavation of erosion control ditches

Erosion control ditches were placed on materialized contour-line with the size of 4m*0.50m*0.50m. Inter-ditches space of 0.50m*0.50m levelled at 0.10m lower compared to the level of ditches. This lowering allows the ditches of the same contour line to share water and avoid runoff. Note that disposal of removed soil in the ditch had to be put downside of ditch and compacted to avoid displacement in rainy season.

Photo, Materialization of Control erosion ditches (Rulindo 2018)

Pegging and pitting

Pegging of pits was done at spacing of 2m*2m with triangle planting (quinconce) pattern. Pits were dug at the size of 0.40m*0.40*0.40.
Density of 2500 trees per ha fit well in biomass production while *quinconce* was used to avoid competition between planted tree and strengthening erosion control.
Removed soil from pit is disposed properly near the pit by separating biological /arable soil to sub-soil/neutral. After size checking by technician, top soil is refilled in the pit to avoid over drying of internal layers of pit.
Forest plantation in Rwanda is done on marginal and sloppy hills and mountains where water holding capacity of the soil is low; it is advised to refill pit in trough form to allow tree to get enough water during rainy season.

Photo, Pits ready for planting (Kabeza, Gakenke District 2018)

2.11. Seedlings acquisition

Good quality seedlings are essential to guarantee good quality forest production in satisfactory quantity.
The best way to acquire good quality seedlings is to self-produce them while respecting technical standards. The production of seedlings should start in April-May to allow the availability of seedlings in October-November. The seeds to be used should be of good quality and their origin should be known and certified; The nursery site should be close to the PFMU site to be afforested or close to the road leading to this site; It should be near the source of water to facilitate watering; The slope should be low and the soil should be good and permeable. The management of the nursery should consider climatic conditions. In that way, the effect of low night-time temperatures is controlled by using plastic covers on the nursery beds; Sun and rain are also controlled by removable shading. Hygiene should be assured in nursery until the planting time. Before transporting seedlings to the planting site, their selection should be carefully carried out to ensure that only good size and quality seedlings are taken from the nursery. These quality seedlings should be received by the technical team in the presence of FSP.

2.12. Tree planting

Tree planting consist of placing good and healthy seedlings in the centre of the pit, where seedlings substrate has to be inside the pit and soil filmed around seedlings to avoid big poles in the pit that may be filled by soil aggregate following rainfall and nursery substrate get exposed, then detached and seedlings uprooted. The attention has to be paid to the planting schedule where tree planting is supposed to start end of October (rain fall consistence to be checked). It is advised to complete all site preparation activities not later than end September.

Photo Tree planting (Kinyami, Gicumbi District 2018)

2.13. Beating up

Refill of dead seedlings or beating up is done one month after plantation (January). The seedlings for beating up were calculated as 20 % of total produced seedlings and left in nursery during first picking up. The period of beating up has to be respected to avoid heterogeneous strata of established forest.

2.14. Weeding

Different types of weeding have to be effected few months after plantation up to when tree canopy cover fully the soil surface (1-3 years).
Ring weeding: Ring weeding and beating up are done simultaneously. While others should be done depending upon weed status.

Photo, weeding activity, Gicumbi District, 2019

It has been noted that cultivation in new forest plantation until crop chest lead to weeding cost cut –off and speed in tree growth; but this is advised on to gentle slope and soil with good site index.

***Key important points to succeed reforestation and forest establishment in general**:*
-Matching species to site
-Planting only healthy vigorous seedlings
-Good timing of planting season
-Planting holes of sufficient size and better filled
-Appropriate weeding

2.15. Collaboration between forest owners' cooperative and FSP

Forest owners' remove themselves exiting tree stocks in their respective parcels, this is very important because it may delay all other activities. The cooperative members play also the role of quality and quantity assurance by verifying if what FSP did fit the quantity and standards set. They remark individual parcels boundaries to avoid related potential conflict because the first physical boundaries may be destroyed during site preparation.

2.16. Evaluation and acceptance of reforestation work

The evaluation and acceptance of reforestation works is done in two phases.

Provisional reception of plantation is done three months after tree planting (March) and final reception to be done 4 months after provisional reception (July). The reason behind this reception is to make sure if afforestation /reforestation activities were done according to the plan. The reception has to be free of emotion and bias; with this regard all works related to provisional reception have to be planned in the office in participative way and sample size has to be representative and allocated randomly on the field. The team in reception should be composed by: representative of the project, representative of National forestry authority, representative of the District, representative of forest owners 'cooperative and representative of forest service provider. The team members should be competent forest personnel to be able to track and trace all forest plantation related defaults and deliver relevant technical recommendations.

The Annex 1 of this note is presenting the methodology of reception in detail.

2.17. Design, elaboration and signature of Simplified Forest Management Plan (SFMP)

Sustainable forest management plan for private forest consists of elaboration of technical and participative document which has to guide all management of afforested/reforested PFMUs. This document is duly signed and stumped by the President of forest owners' cooperative on the in behave of cooperative members (in charge of daily management of consolidated private forest plantation) and the Mayor of the District where the PFMU is located (in charge of technical assistance of cooperative and linkage of cooperative and market of forest products).

Blocks are designed in the way that it allows cyclic and rotational harvesting. In fact, one block to be harvested in year one, another in year two until the last block and the following year to start without stoppage to the block one where cycle had been started because the coppices have had enough time to regrow. The four harvesting cycle of 5 to 12 years' cycle followed by conversion was found effective to eucalyptus spp in production of fuel wood. Note that coppice with standards had been recommended and incorporated in SFMPs to allow forest owners to get both fuel wood, electrical transmission poles and sawn logs, the standards that will be harvested at end of rotation will allow cooperative of forest owners gather enough resources to be used in next conversion of their forests.

For more information on SFMP, the annex 2 shows a sample.

2.18. Handover of reforested PFMU to the forest owners

The official hand over of PFMUs is a very important step in PFMU approach and the clear evidence to nullify the biased understanding of some forest owners and neighbours who refused to join approach. Based on testimonies from the field, those who refused to enter cooperatives are highly regretted after realising that the productive forests still fully owned and managed by their owners. Beside efforts and high professionalism of extension staffs, speculations and roomers in local people talk about appropriation of private old and degraded forests by government through its conversion. Handover minutes should contain mainly: Name of PFMU and area (re) planted, tree stock, name of cooperative of forest owners and has to be duly signed and stumped by President of cooperative, Mayor of the District where PFMU is located and Director General of Rwanda Forestry Authority. The signature of handover meeting should take place on PFMU site and in public.

2.19. Implementation of SFMP

After handing over the rehabilitated PFMU forests to the Owners, the Leaders of the forest owners cooperative should start implementing the simplified forest management plan (SFMP). The District technical team and the Leaders must ensure that the various prescriptions of this plan are respected by the forest owners and the cooperative leaders. They should help them launch other income-generating sub-projects based on local opportunities, negotiate an attractive market for their forest products, and resolve any conflicts that may arise.

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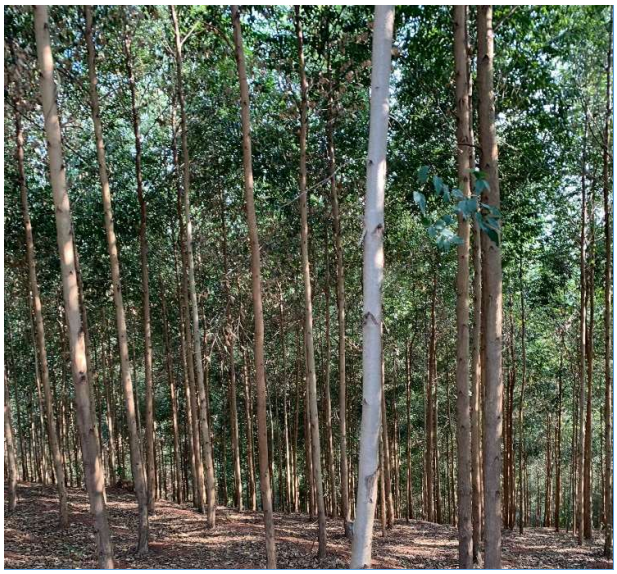
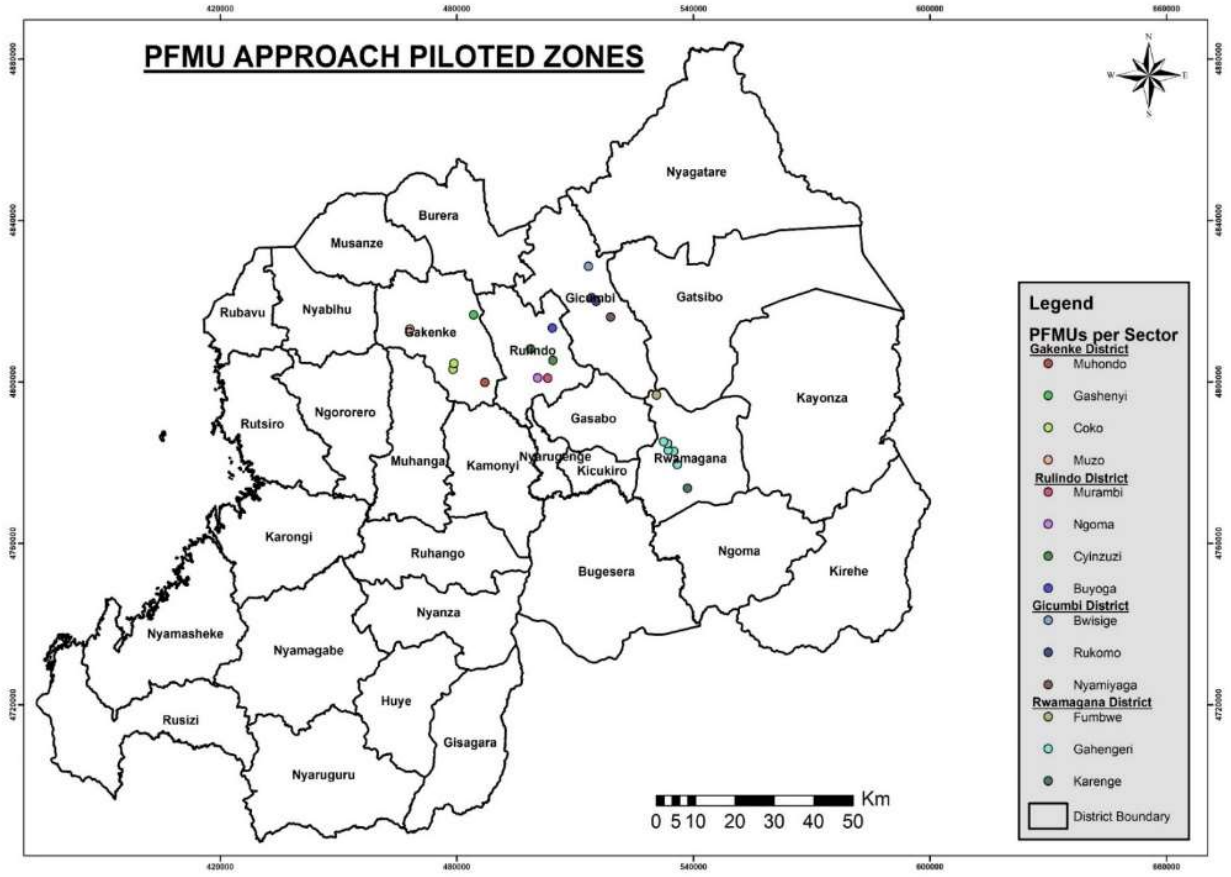
III. FMBE PROJECT ACHIEVEMENTS IN PILOTING THE IMPLEMENTATION OF PFMUs.

3.1. FMBE Project achievements

In piloting PFMU approach, FMBE project had covered **873.09 ha managed by 19 forest owners' cooperatives where in** the planting season 2018/2019, 8 PFMUs of 265.07Ha were established and rehabilitated across the 4 districts (see map below), while in planting season 2019-2020, additional 608.02 ha grouped into 11 PFMUs have been rehabilitated. The map below presents special arrangement of PFMUs established by FMBE in four districts.



Photo, PFMU , Gahengeri-Rwamagana District, 202



Established cooperatives and results of Final reception of replanted private forests

The table below shows details of PFMU established, cooperative of forest owners in charge of PFMU management and the results of final evaluation of PFMUs.

Season	District	Sector	PFMU name	Cooperative name	Slope Area (ha)	Number of trees received
2018/2019	Gakenke	Muhondo	Kabeza	TUBUNGABUNGE ISHYAMBA-Kabeza (KOTIKA)	27.36	67767
		Coko	Nyabitare	TWITE KU MASHYAMBA-COKO (KOTMACO)	29.1	74022
	Rulindo	Buyoga	Gikingo	DUTEZE IMBERE AMASHYAMBA-NDARAGE-(KODIMANDA)	31.25	71985
		Ngoma	Mugote	REKA RYERE-Mugote (KORERMU)	50.6	140284
	Gicumbi	Bwisige	Nyabushingitwa	TWITE KU BIDUKIKIJE-NDAYABANA (KOTBIN)	30.67	77516
		Rukomo	Kinyami	Koperative y'Abakundashyamba Kinyami (KOPABAKI)	21.36	52536
	Rwamagana	Fumbwe	Fumbwe	Koperative Turegere Amashyamba- Byimana-Birembo (KOTABB)	28.16	65685
		Gahengeri	Gahengeri PFMU 3	Turengere Ibidukikije Gahengeri (KOTIGA)	46.57	112233
2019/2020	Gakenke	Coko	Rwahi	Koperative Dukunde Amashyamba Rwahi (KODARWA)	44.89	118178
		Muzo	Ryango	Koperative Abakunda igiti-Muzo (KOABIMU	28.02	73838
		Gashenyi	Rutenderi	Koperative bayita Twite ku Bidukikije-Rutenderi (KOTBIRU)	36.81	98245
	Gicumbi	Nyamiyaga	Kagamba	Tuvugurure Amashyamba-Kagamba (KOTAKA)	54.24	140817
		Rukomo	Rwampyisi	Koperative y'Abakundashyamba-Kinyami (KOPABAKI)	45.98	120963
	Rulindo	Cyinzuzi	Nyakabanga	Koperative Twite ku Mashyamba Nyakabanga (KOTMANYA)	41.65	108523
		Cyinzuzi	Rusagara	Koperative Tubungabunge Amashyamba-Rusagara (KOTARU)	37.49	95931
		Murambi	Kabeza	Koperative Turibungabunge-Kabeza (KOTUKA)	35.94	87205
	Rwamagana	Gahengeri	Gahengeri PFMU 6	Koperative Twite ku Mashyamba –Kamulindi (KOTMAKA)	57.43	132262
			Gahengeri PFMU 4	Koperative Twite ku Bidukikije- Kibare (KOTBAKI)	61.88	142759
			Karenge PFMU 7	Koperative Dushyigikire Ibidukikije –Nyamatete KODUNYA	164.69	443665
	TOTAL				**874.09**	**2,224, 414**

3.2. Cost of reforestation works

In this part, the technical note is giving an estimate of costs related to the reforestation works. Some activities are not included such as planning activities, mobilization, training sessions, existing stock removal, fire breaks and maintenance activities related to the management of coppices if the forest is managed in coppicing or in coppice with stand.

BUDGET FOR AFFORESTATION OF ONE HA

N°	Designation	Unity	Quantity	Unitary Price(Rwf)	Total Price (Rwf)
1	Identification & Mapping	ha (lump sum)	1	50000	50000
2	Bush clearing	person days	20	2000	40000
3	Pegging Contour lines	person days	5	2000	10000
4	Pegging pits	person days	10	2000	20000
5	Digging anti-erosive ditches	long in meter	300	170	51000
6	Digging pits or holes (pitting)	Number	2500	34	85000
7	Transport of seedlings	Number	2500	20	50000
8	Seedlings acquisition (production/buying)	Number	3250	50	162500
9	Tree Planting	Number	2500	20	50000
10	Beating-up	Number	750	40	30000
11	Weeding	Number	2500	40	100000
12	Stumps reduction/extraction	Number	100	600	60000
13	Stumps debarking	Number	1000	80	80000
14	Fire breacks		0	0	0
TOTAL					**788500**

N.B: The mean of one person-day is paid 2000RWF (including both casual and work supervision).
1US$=1000 Rwf=0,882 €
1ha is planted with 2500 seedlings

3.3. Benefit expected from a PFMU

a) Financial benefit

Based on the SFMP, a PFMU can be managed sustainably while providing products, service and money to forest Owners.

The projection made during the elaboration of simplified forest management plan for rehabilitated PFMU in northern province, gives the mean production of 246m³ per ha in conditions here-under described in the table.

Area	Number of trees/ha	Specie	Soil conditions	Treatment regime	Mean Annual Increment (MAI)	Distance between trees in high forest	Duration of coppices	Full rotation cycle	Expected harvest
1ha	2500	Eucalyptus sp.	Medium	Coppice with stand	8m³	12	6-7 years	32 years	246m³

Assuming that 20% of the tree production is timber and 80% is energy wood, we can estimate the revenue as following:

- *Revenue from timber*: 246m³x0.2x102040rwf=5'020'408rwf (whereas the cost of one plank of 350cmx4cmx14cm is 2000rwf).

- *Revenue from energy wood*: 246m³x0.8x17000rwf=3'345'600rwf (whereas the cost of one stere or 0.7m³ is 12000rwf)

The total revenue from one ha at the end of full rotation cycle in above mentioned conditions is 4100000rwf+3345600rwf=8'366'000rwf.

We can conclude that after each 6-7 years (period required for coppice harvesting), one ha of a PFMU will generate a mean revenue of more than two million.

b) Other benefit

Besides the financial benefit of the tree products sold, the PFMU establishment and management has more other advantages such as:

- Labour creation during the site preparation, forest establishment and forest harvesting;

-Acquisition of knowledge and skills for local people involved in the reforestation works guaranteeing the respect of technical standards during forest cycle management;

-Increasing the productivity of private forests;

-Availability of forest products from private land;

-Erosion control by increasing the infiltration of rainwater;

-Established forest provides different services such as carbon sequestration, improving soil quality, ecological niche;

-Establishment of partnership with the District in mobilisation and creation of Forest Owners' cooperative, in monitoring of reforestation works and in management of PFMU;

-Availability of an opportunity for partnership with Private Forest Operators in PFMU management and in Forest products marketing;

-The cooperative created to manage PFMU can initiate other income generating activities such as Beekeeping, management of nurseries, marketing of forest products, processing of forest products, …

-Availability of opportunity for mutuality activities such as tontine among forest Owners to solve short term needs (medication fees, school fees for children, cultivation inputs, …)

THE MAIN LESSONS LEARNT FROM PFMU PILOT EXPERIENCE

- *Strong awareness and sensitization/training session are required to convince forest owners and get them fully confident and involved in the process;*
- *The successful sensitization requires the identification and strong mobilization support of local leaders and officials (from Cell/Sector/District);*
- *Forest owners quickly understood the advantage of respecting rotation according to SFMP to increase forest productivity;*
- *The main concern is about the first 5 years' period from the new planting (2018) until the first harvesting, for which they cannot harvest any tree: a bit of worry about income generation in these early years, however they understand the opportunity that after this 5-year period, an annual harvesting will provide regular and even significantly higher income over the years);*
- *This system allows farmers not having sufficient investment (money, man-power) capacity to shift from poor management of their old forest to high productive plantations;*
- *Working in cooperative provides additional opportunities of initiating other income generating opportunities, such as honey- bees rearing and production, etc…*
- *Within Cooperative, these farmers have an easy joint access to financial loans with consolidated collateral (Caution solidaire for any member of cooperative by his peers);*
- *Within cooperatives, marketing of their wood products becomes easier: already some private companies like the former Pellet- Making Inyenyeri had started contacting these cooperatives in order to sign a supply contract of wood products from the pruning in next 2 years. Similarly, the Wood –Industry Saw Mill East Africa Ltd has been contacted and interested to also sign the supply contract with these Cooperatives.*
- *Grouping smallholder forest owners in cooperatives also becomes an easier way of conveying other development initiatives (such as health insurance, saving schemes etc….)*
- *However, the cooperative success requires support (coaching, training, M&E) to increase and sustain their management capacity.*

ANNEX 1:

Methodology of reforestation works reception

Some site preparation activities (stump extraction, stump debarking, anti-erosive ditches digging, fire break) are very costly and often should be made in the field a long time before final acceptance of plantation activities. So, to allow the FSP to benefit from an intermediate installment payment and to properly ensure the remuneration in due time of man-power, it is highly recommended to proceed with a separate acceptance of these costly site preparation activities.

Stump extracting: it concerns roots extracting/ total removal which is advised only on gentle slope and stumps that fall into marked area of ditches.

Stump Debarking: it concerns the removal of bark on every stump, to be repeated until the stump died. It had been observed that the coppicing ability of Eucalyptus spp died at 3-4 times of sprouts removal.

For each site, an estimation can be done as follow:

- Full counting if the site is small and/or the number of a stump is not so high (<1000)
- By sampling, if the number of the stump is higher:
- Plots of 30mx30m must be distributed randomly across the area (**A in ha**) of the site in the way to be the most representative;
- The number of plots (**np**) must be estimated to sample at least 10 % of the total number of stumps;
- Number of stumps truly and adequately treated must be counted in every plot (**ns**);

total number of stumps really and adequately treated for the entire site (QR in Nbr of stump) is estimated as follow:

QR = A x (sum of ns) / (np x 0.09)

Creation of anti-erosive ditches: ditches must be systematically arranged in staggered following contour line according to the level curves of standard sizes (50 cm wide, 50 cm deep, and 4 m in length).

Different ditches are separated by a land portion of 50cm which was lowered to 10cm depth.

All this parameter to be verified by the use of meter tape.

The estimation/measurement of the quantity truly and adequately realized in the field (QR) to be done according to the best method agreed by the assessment team in the field in the function of site and works configuration.

For each site and each above type of preparation works, QR is compared with QP (quantity planned for the site) to determine the final quantity that has to be considered as accepted (**QRA**):

- If QR > QP, **QRA = QP**;
- If QR < QP, **QRA = QR**.

The following table can be completed:

Site name	Stump extraction (number of stumps)			Debarking (number of stumps)			Ditches (m)		
	QP	QR	QRA	QP	QR	QRA	QP	QR	QRA

For the **maintenance activities (wedding/cleaning),** the planned quantity QP (in ha) to be maintained is estimated for each site in the ASP. The quantity truly and adequately realized in the field (**QR** in ha) is estimated for each site as follow: **QRA = R% x QP**, where R% is the percentage of the wed area of the site that has been wed and cleaned. Depending on site and works configuration, the assessment team decide on the best method to estimate R%. R% cannot exceed 100%.

For each site, the quantity realized and accepted (QRA) The surviving rate (S)in % estimated as follow:

- S%= QSG/QSP * 100, where QSG is the quantity of surviving seedlings at the time of this additional guarding acceptance and QSP is the quantity of surviving seedlings at the time of final planting acceptance.

Assessment/Acceptance of PLANTING ACTIVITIES

The acceptance of the planting activities should be done at two strategic times:

- Intermediate acceptance in March, just after the first planting of October- December and direct beating-up of

January

- Final acceptance in July, just after Indirect beating-up of February-April.

The acceptance must be done accordingly to the afforestation data collection procedures defined in the DFMP-FMES (Forestry sector Monitoring and Evaluation System), which has been established (2015) by the RNRO and redeveloped by RFA 2021. The objective of acceptance is to get an accurate estimation of the total number of surviving seedlings (**QR**) properly planted (in accordance with technical prescription), in every afforested/reforested site.

For the intermediate acceptance of plantation (done just after planting in December/January each year), stands where the success rate (=Quantity of surviving seedlings truly planted/ Quantity of planned seedlings) is under 75% will not be considered as accepted. These planted seedlings in not accepted sites (rate <75%) will not be taken into consideration in the invoice calculation for the related installment.

Additional necessary planting and beating-up should be done in not accepted sites/sections.
The minimum dimensions of the planting holes will be 40 cm x 40 cm x 40 cm.
For this issue, the technician walks along the perimeter of the site and marks a sufficient number of waypoints using the

1. ***Measurements and completion of the field form (template) in the field***:
   1.1. **Forest perimeter recording, using a GPS-TABLET** (the first measurement to be done)

GPS-TABLET. It is recommended to use waypoints instead of a track because it is not always possible to cross all the zones on the site (obstacles). Furthermore, a discontinuous recording (waypoints) enables the technician to take the time to accurately locate the boundaries of the area to be deforested. The number of waypoints to mark will depend on the shape and the size of the site. It is necessary to have a sufficient number of recorded waypoints so that the site boundaries are correctly approximated and well-mapped afterward. The end of the measurement occurs once the site has been completely encircled (i.e. once the technician reaches the starting point again).

Every waypoint must be named properly as follow: put the first 3rd letters of the name of the site followed by the croissant numerous of the point from 1 to XX for the last point (for example: for Gaginca forest site with 25 waypoints in total, waypoints must be named: GAC1 for the first, GAC2, GAC3……until the last one GAC25). N.B:

- *GPS-TABLET must be set in the following format:*
  - *Map Datum: WGS 84*
  - *Map Spheroid: WGS 84*
  - *Position format: hddd.ddddd° ("degré centesimaux")*
  - *Unit for distance and speed: metric*

Latitude georeferencing must be a positive figure in the Northern hemisphere and must be a negative figure in the Southern hemisphere. Sampling design

For the next measurements to be realized in the field (see points below) it is recommended to use a random sampling method. For this issue, sample points (sample unit) must be randomly distributed in the entire area of the site, covering the site to be representative. Each sample point consists of the starting point of measurements to be done in each sample unit.
If the map of the site can be available before these measurement operations by sampling, the GIS officer can ensure from the office the random distribution of the sample points in the map, and provide for each point the GPS-TABLET coordinates. In the field, the DFNRO can find every sample point using GPS-TABLET to start measurements.
If the map is not available before measurement, the DFNRO will choose directly in the field the location of every sample point, keeping in mind that these samples must be representative of the site.

- The number of sample points **(NSP)** to be sampled:
  - For a site where an area is < 0.5 ha: between 1 and 2 sample points
  - For a site where 0.5 ha< area < 2 ha: between 3 and 10 sample points
  - For a site where the area is > 2 ha: between 10 and 20 sample points

2. Estimation of **plantation tree density (Td)**

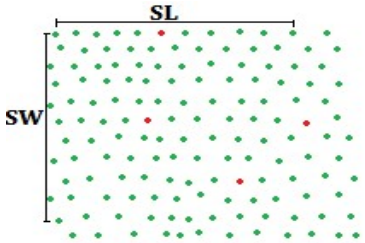
Only for full site plantations and radical terraces.

3. **SW**M and SLM measurements by sampling

SWM and SLM measurements In forest plantation (full plantation)

From each sample point:

- Measurement of the total distance between the 1st and the 11th theoretical trees in the same line, equivalent to 10 tree spacing on the line (**SL, [meter]**).
- Measurement of the total distance between the 1st and the 11th theoretical parallel lines, equivalent to 10 spacing between adjacent lines (**SW, [meter]**)
  Note: Died trees or no planted holes must be taken into account. Here below is a representation of a sample (green: living plants; red: missing/dead plants).



➢ **SWM and SLM** measurements In Radical terraces (agroforestry)

The method is the same as for full site plantation (see point above).
When the spacing between the line is too high (more than 10m), the measurement of SW can be done between 1th and 6th lines, equivalent to 5 spacing between adjacent lines.

4. **Theoretical plantation tree density (Td)** calculation (number of theoretical plants or holes/ha) :

After **SW** and **SL** measurement in every sample point, the average of spacing between trees inline (**SLM, [meter]**) and the average of spacing between trees of parallel lines (**SWM, [meter]**) are calculated (see the formula in the form of field reception of planted seedlings).

The plantation tree density **(Td)** is calculated as follows:

Td = 10 000 / ((SLm) x (SWm)) =[trees/ha]

5. **Survival rate (SR)** estimation [% of surviving trees /theoretical number of tree considering plantation tree density]. ***Only for full site plantations and radical terraces.***

The method consists of a **sampling of approximately 10% of a theoretical number of trees to be planted** and recording their state/condition (good condition/dead/missing/poor condition). For this issue, each sample point defined in chapter 1.2 will be used as the starting point of each sample unit. Npt = Number of theoretical trees/holes to be sampled per sample point (per sample unit)

NbST = ThNT /(10*NSP) with:

➢ ThNT= Total theoretical number of trees to be planted in the total area of the site
➢ NSP= number of sample points to be done in the site

From each sample point, every theoretical tree or hole (from 1 to Npt) is controlled, following 2-4 lines in a given direction.

For each sample point, the total number of theoretical plants (**Npt**) actually controlled is recorded as well as the total number of surviving plants (**Nps**). The measurement should be made by using a mechanical counter to facilitate the recordings. Recorded data from each sample point must be registered in the paper form (see annex 3 of the template PROC16b&41).

5.1. The average survival rate is calculated as follows: **SR = Nps/Npt x 100 [%]Species proportion (Sp%)** estimation

In the case of a plantation of 2 different species in separated but joined areas, each area containing one only species must be considered and recorded as one separate site. GPS-TABLET recording must be done separately for each of the areas (GPS-TABLET waypoint names must be made a clear distinction between 2 joined areas) and data must be recorded in a separate field form. In this case, the species proportion for the only species of each site is 100%.

In the case of a plantation of 2 or 3 species randomly mixed in the same area, it is not possible to separate the area covered by each species. In this case, the proportion of each species must be estimated. For this issue, data in the field must be recorded as follow:

- For full site plantations and radical terraces: during the process of survival rate estimation, when a team is registering the total number of surviving plant in the field (Nps), this data is recorded making a distinction between the 2-3 concerned species.

  (Sp%) can be calculated as follow:

  - Sp% for species 1 = Nsp1/Nps * 100
  - Sp% for species 2 = Nsp2/Nps * 100
  - Sp% for species 1 = Nsp3/Nps * 100

  With Nsp1= number for sp1, Nsp2= number for sp2……etc.

  ATTENTION:

- Only the following species are registered in the system: Eucalyptus spp, Pinus spp, Callitris, Cypress, Grevillea, Jacaranda, Alnus acuminate, Black wattle, Acacia melanoxylon, Maesopsis, “Mixed” (of species above), or “Others”.

- In the case of plantation with more than 3 of the species listed above, the 2 first dominant species are registered with their species name in the 2 first registration colons, but the others are gathered and registered as "mixed" in the last 3rd colon.

In the case of plantation with more than 3 species, 1 or 2 listed above and others not listed above, the 1 or 2 listed species are registered with their species name in the 2 first registration colons, but the others are gathered and registered as “other” in the last 3rd colon.

Form of field Reception of Seedlings planted

Date:…… Site:……

Sample point	Distance between a nbr of Tree-seedlings (for full site & rad terrace only)				Nbr of theoretical plants (for full site & rad terrace only) (Npt)	Nbr of surviving plants (Nps)		
	In the line		Between lines			Spec 1	Spec 2	Spec 3
	SL (m)	Nbr of "ecartement"	SW (m)	Nbr of "ecartement"		Name sp:	Name sp:	Name sp:
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
Total								
	TSL	**TNbEcartL**	**TSW**	**TNbEcartW**	**Npt**	**Nsp1**	**Nsp2**	**Nsp3**
Average						**Nps**= Nsp1+Nsp2+Nsp3=		
	SLm		**SWm**			**SR%**= Nps/Npt*100=		
	SLm= TSL/TNbEcartL					**Sp% sp1**= Nsp1/Nps*100=		
	SWm= TSW/TNbEcartW					**Sp% sp2**= Nsp2/Nps*100=		
For full site or radical terraces Td = 10 000 / ((SLm) x (SWm)) =						**Sp% sp3**= Nsp3/Nps*100=		
For progressive terraces only Tds = 5 x Nps/ Nbr of sample point=								

ANNEX 2:

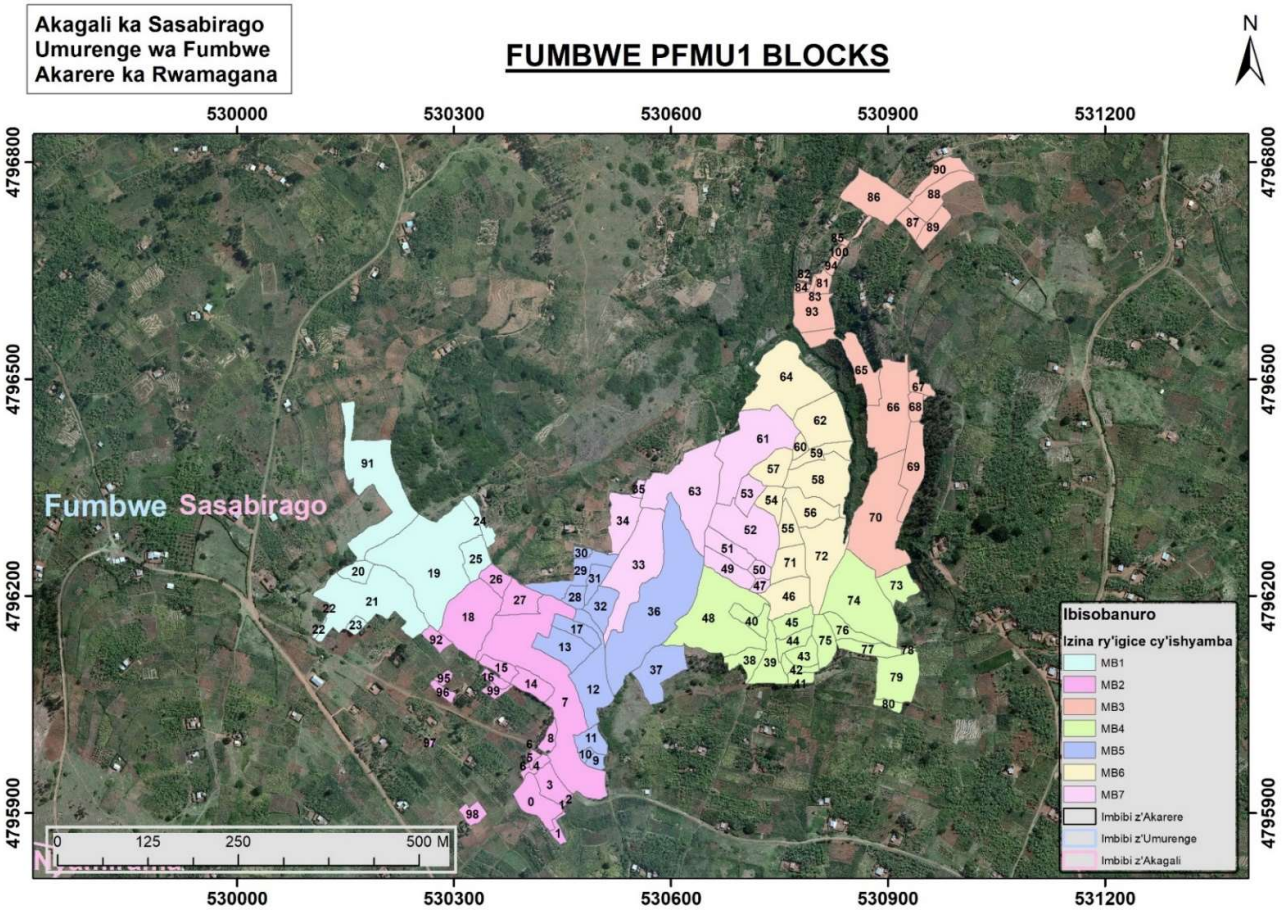
Sample of SFMP showing the main components

Introduction

This simplified forest management plan has been prepared to meet the requirements of forest law in Rwanda where it is stipulated that all forest with 2 ha should have a simplified forest management plan to be approved by the District.
The implementation of this forest law is reinforced by the FSSP, 2018-2023. This FSSP is including the grouping of private forests into PFMUs for better management.
It is in that regard, the current SFMP has been developed for the (Name of PFMU) grouping private forest located in ….. Cell, ….. Sector, District of ……..
This PFMU has an area of …… Ha rehabilitated in tree planting season of ……/…..; with …. parcels distributed in … management blocs to be exploited in different successive years as specified in this management plan.
For better management, the forest Owners are grouped into the cooperative called ***…….*** *(Cooperative name in short) which is in charge of the implementation of this SFMP.*
This SFMP runs from …. to …..
This SFMP could be revised every five years or at the request of the cooperative.
Any modification of this SFMP should be approved by the District after consulting the National Authority in charge of forest management.

This SFMP was prepared on	*This SFMP was approved on*
……..	……..
by:	*by :*
Mr : ……	*Mr : ……*
President of the cooperative:	***Mayor of the District of:***
……	……

Map of PFMU and Blocks



List of forest owners

List of parcel owners			PFMU Name: …….					
FID	Parcel owner name	LAIS ID	Horizontal area -ha	Area corrected by slope - Ha	% of the total area - ha	Management Block - MB	% of the area of the MB	Comment
1								
	Total							

Management decisions

Management decisions	PFMU Name: …….

Management Block	Area corrected by slope - Ha	% of the total area (by slope) - ha	Average soil quality	Planting years	Average tree planting density	Main tree species	Silviculture regime	Spacing between Standard (m)	Expected average growth (m3/ha/year)	Number of parcels
MB1										
MB2										
TOTAL										
Number of block = number of years of rotation for coppicing 2, 3 and final cut =										

Harvesting plan

	Expected harvesting per year							PFMU Name: …….				
	Coppice 1			Coppice 2		Coppice 3		Final Cut			Full rotation cycle	
Management Block	Rotation Coppice 1	Year Coppice 1	Volume (m3) Coppice 1	Year Coppice 2	Volume (m3) Coppice 2	Year Coppice 3	Volume (m3) Coppice 3	Year Final Cut	Volume (m3) Final cut from coppice	Volume (m3) Final cut from standard	Number of years	Total Volume (m3)
MB1												
MB2												
TOTAL												

Silvicultural plan

Silviculture planning	PFMU Name: ……						
	MB1	MB2	MB3	MB4	MB5	MB6	MB7
Planting Stump debarking 1st							
Stump debarking 2nd Clearing vegetation							
Coppice 1 Ditch cleaning Pruning of standard							
Coppice reduction							
Coppice 2 Ditch cleaning Pruning of standard							
Coppice reduction							
Coppice 3 Ditch cleaning							
Coppice reduction							
Final cut Ditch cleaning 1st Stump debarking Planting							
2nd Stump debarking Clearing vegetation							
Clearing vegetation							

List of PFMU Forest Owners

N° y'igice cy'ishyamba (Management Bloc number)	Izina ry'igice cy'ishyamba (Management Bloc name)	Amazina ya ba nyir'amashyamba (Names of forest Owners)
MB1		
MB2		
MB3		
MB4		
MB5		
MB6		

ANNEX 3:

Minutes Sample of PFMU handover to Forest Owners after the rehabilitation process

REPUBLIC OF RWANDA

DISTRICT of RULINDO

Enabel

REPUBLIC OF RWANDA

RWFA

INYANDIKOMVUGO Y'IHEREREKANYA-BUBASHA KU MICUNGIRE Y'IMPUZAMASHYAMBA YA MUGOTE

HAGATI Y'UBUYOBOZI BW'AKARERE/RWFA NA KOPERATIVE KORERMU

Itariki: ……../09/ 2019

Mu rwego rwo gushyira mu bikorwa Gahunda y'igihugu y'imicungire y'amashyamba (FSSP,2018-2023) , Umushinga FMBE uterwa inkunga n'igihugu cy'Ububiligi, ugashyirwa mu bikorwa n' ikigo cy'igihugu gishinzwe gucunga no guteza imbere amazi n'amashyamba (RWFA) ku bufatanye n'ikigo cy'Ababiligi gishinzwe iterambere (ENABEL) hamwe n'Akarere ka RULINDO, hashyizweho impuzamashyamba (PFMU) ya "MUGOTE" iherereye mu Murenge wa NGOMA, Akagari ka MUGOTE, ikaba ifite ubuso bungana na 50,6ha z'amashyamba yasazuwe mu gihembwe cyo gutera ibiti cya 2018-2019.

Iyi mpuzamashyamba icungwa na Koperative yitwa REKA RYERE-MUGOTE yashinzwe na ba Nyir'amashyamba agize iyi mpuzamashyamba nk'uko bagaragara ku mugereka w'igenamugambi ry'iyi mpuzamashyamba.

Isuzuma ry'imirimo yo gusazura amashyamba agize iyi impuzamashyamba yatewe inkunga n'umushinga wa FMBE riheruka

gukorwa mu kwezi kwa Nyakanga 2019, ryagaragaje ko umubare w'ibiti 140284 byafashe kandi birimo gukura neza.

Guhera kuri iyi tariki, hemejwe ko imicungire myiza y'amashyamba agize impuzamashyamba ndetse no kuyakorera imirimo yo kuyitaho ari inshingano za koperative n'abanyamuryango bayo.

Abanyamuryango ba koperative biyemeje:

- Gushyikiriza Akarere inyandiko y'igenamugambi ryoroheje (SFMP) ry'impuzamashyamba bitarenze ukwezi kw'Ugushyingo 2019;
- Gucunga no gukurikirana imikurire y'ibiti byabo, babibagarira kandi babyicira uko bikwiye kugeza igihe cy'isarura, no gusarura kuri gahunda izaba igaragazwa n'iginemigambi ry'iyi mpuzamashyamba (SFMP) rizashyikirizwa kandi rikemezwa n'Akarere.
- Guteganya mu mategeko y'umwihariko ya koperative ingingo zigaragaza iyubahirizwa ry'igenamugambi ryoroheje (SFMP) ku banyamuryango bose, hagateganywa ibihano ku batazayubahiriza.

Ikigo gishinzwe gucunga amazi n'amashyamba (RWFA) gifatanyije n'Akarere, biyemeje gukomeza gufasha Koperative muri ibi bikurikira:

- Gutegura no gushyikiriza Akarere igenamugambi ryoroheje (SFMP);
- Gukomeza gutanga amahugurwa agamije kunoza imikorere n'imicungire ya Koperative;
- Gufasha Koperative mu gushaka isoko ry'ibiti byabo, bahuzwa n' ibigo by' abikorera n'abashoramari.

Akarere kiyemeje kandi, nyuma yo kwemeza igenamugambi ryoroheje, gukurikirana ibikorwa ku buryo buhoraho, hasuzumwa ko gahunda ikubiye mu igenamigambi yubahirizwa, kandi ko isarura rikurikiza gahunda yumvikanyweho. Nk'uko biteganywa n'itegeko, Akarere niko kazajya gatanga uruhushya rwo gusarura hashingiwe ku igena migambi ryemeranyijweho.

Abashyize umukono kuri iyi nyandiko:

Ku ruhande rwa Koperative	**Ku ruhande rw'ikigo gishinzwe gucunga no guteza imbere amazi n'amashyamba (RWFA)**	**Ku ruhande rw'Akarere**

Mr	**Mr .....**	**Mr.....**
Perezida	**Umuyobozi Mukuru**	**Umuyobozi w'Akarere**