



RESTRUCTURING PAPER
ON A
PROPOSED PROJECT RESTRUCTURING
OF
GAZETTED FORESTS MANAGEMENT PROJECT
APPROVED ON MAY 30, 2019
TO
MINISTRY OF ECONOMY OF THE REPUBLIC OF BENIN
ENVIRONMENT, NATURAL RESOURCES & THE BLUE ECONOMY
AFRICA WEST

Regional Vice President:	Ousmane Diagana
Country Director:	Coralie Gevers
Regional Director:	Simeon Kacou Ehui
Practice Manager/Manager:	Maria Sarraf
Task Team Leader(s):	Salimata D. Follea



ABBREVIATIONS AND ACRONYMS

CENATEL	National Center for Remote Sensing and Ecological Monitoring (Centre National de Teledetection et de Suivi Ecologique)
CMU	Country Management Unit
CTAF	Technical Forestry Management Unit (Cellule Technique d'Aménagement Forestier)
DGEFC	Directorate General of Water, Forests, and Hunting (Direction Generale des Eaux et Forêts et Chasse)
FSOA	West Africa Savannah Foundation (Fondation des Savanes Ouest-Africaines)
GF	Gazetted Forest
GoB	Government of Benin
GP	Global Practice
IDA	International Development Association
NFF	National Forest Fund
IPMU	Integrated Project Management Unit
ISR	Implementation and Status Results
MCVDD	Ministry of Environment and Sustainable Development (Ministère du Cadre de Vie et du Développement Durable)
MRB	Rural Wood Markets (Marchés Ruraux de Bois)
NTFP	Non-Timber Forest Product
PDO	Project Development Objective
PIU	Project Implementation Unit
PRMP	Personne Responsable des Marchés Publics
SME	Small and Medium-Sized Enterprise



BASIC DATA

Product Information

Project ID P167678	Financing Instrument Investment Project Financing
Original EA Category Partial Assessment (B)	Current EA Category Partial Assessment (B)
Approval Date 30-May-2019	Current Closing Date 30-Nov-2026

Organizations

Borrower Ministry of Economy of the Republic of Benin	Responsible Agency Ministry of Environment and Sustainable Development
--	---

Project Development Objective (PDO)

Original PDO

To improve the integrated management of targeted Gazetted Forests, to increase access of the main consumption cities to fuelwood produced sustainably, and to strengthen selected non-timber forest product value chains for forest-dependent communities

Summary Status of Financing

Ln/Cr/Tf	Approval	Signing	Effectiveness	Closing	Net Commitment	Disbursed	Undisbursed
IDA-D4770	30-May-2019	20-Jun-2019	01-Oct-2019	30-Nov-2026	75.00	4.51	70.17

Policy Waiver(s)

Does this restructuring trigger the need for any policy waiver(s)?

No



I. PROJECT STATUS AND RATIONALE FOR RESTRUCTURING

A. Project Status

1. The project was approved by IDA Board of Directors in May 30, 2019 and became effective in October 1, 2019. It has been under implementation for nine months. As of July 1, 2020, US\$4.51 million or 6 percent of the total project financing was disbursed. The progress toward achieving the PDO and overall implementation progress are rated Satisfactory and the project is on track towards meeting its PDO by project closure.

2. The last Implementation Status and Results (ISR) report developed in June 26, 2020 showed implementation progress is on track with the launched reforestation activities. The main results achieved to date include: (i) the production of 1.65 million seedlings of *Acacia auriculiformis* for the establishment of 1,900 ha of wood energy plantations in six classified forests¹; and (ii) the production of 1.79 million Teak species for the establishment 750 ha of timber plantations in the Dogo classified forest. Forest seedlings were produced by forest-dependent communities and local communities whose economic activities have been impacted by the COVID-19 related restriction of movements, in line with the performance-based mechanism put in place by the project. As a result, 1,349 jobs were created, and these beneficiaries received cash on a by-weekly basis through mobile transfer after verification of their performance by the decentralized Forest Management Technical Staff (CTAF: Cellules Technique d'Amenagement Forestier). It is expected that by end-December 2020, 3,200 jobs will be created for reforestation activities for a total transfer of USD3.8 million injected to the local economy.

B. Status of Project Components

Component 1. Support to Forests Governance. Activities in this component are progressing, the project acquired and delivered 27 surveillance vehicles to the Government to be used for forest patrolling. Upcoming activities include the development of socio-economic studies in the targeted classified forests, the revision of forest management plans, the zoning of the targeted classified forests, and the development of technical studies for control and supervision of rehabilitation works/constructions of working and living quarters for CTAFs.

Component 2. Integrated Management of Gazetted Forests. Progress on these activities have been described in the previous section. To date, the forest seedling production activities have provided jobs for the benefit of 1,349 people (men and women) in villages bordering classified forests. The project is aiming for a total of 2,650 ha of plantations in 2020, of which 1900 ha of fuelwood and 750 ha of timber.

Component 3. Development of Selected Non-Timber Forest Products (NTFP) Value Chains. The project has launched a study to modernize honey production for enhanced quality and productivity, thereby supporting to improve the livelihoods of forest-dependent communities engaged in honey production in both Classified and the Rural Domain Forests. 20 modern hives are aimed to be established and honey producers will receive technical assistance to operate them. The production cycle will be monitored over a period of twelve months.

Component 4. Project Management. The Project's Implementation Unit (PIU) is functional, delays were however observed in the procurement process, as procurement is currently centralized at the level of the Ministry's cabinet and conducted by a Person responsible for Procurement (Personne Responsable des Marches Publics - PRMP) which is not in compliance with project legal agreements. It was reconfirmed that a clarification letter was sent to the Minister of Finance by the Country Management Unit (CMU) in order to amend the issue.

¹ The classified forests are Kétou, Dan, Logozohê, Ouémé-Boukou, Agoua, and Tchaourou-Tou- Kilibo.



C. Rationale for Restructuring

3. This restructuring paper seeks to: (i) cancel US\$15 million, corresponding to 20 percent of the initial financing amount from Grant No. D477-BJ; and (ii) adjust the disbursement categories as a consequence of the cancellation. The Government of Benin (GoB) has requested this cancellation with letter received on July 1, 2020 in order to urgently reallocate the funds to support “large enterprises, Small and Medium-sized enterprises (SMEs) in the formal and informal sectors, craftsmen, artisans, drivers/carriers, bar and restaurant owners/managers/employees and formal and informal discotheques”. Despite the large cancellation amount, the Project Development Objective (PDO) continues to be relevant and mostly achievable. Any changes will be included in subsequent project revisions.

II. DESCRIPTION OF PROPOSED CHANGES

4. **Cancellation of Funds:** Cancellation of US\$15 million from Grant No. D477-BJ as requested by the Government of Benin with letter received on July 1, 2020.

5. **Change in Disbursement Arrangements under Component 1, 2 and 3.** This restructuring will not result in a reallocation across disbursement categories, but a reduction of disbursement in selected components. Following funds will be reduced or cancelled from the selected sub-components and activities:

Sub-component 1.1: Capacity enhancement of the Forestry Administration, current: US\$8.59 million, proposed: US\$4.59 million.

6. The objective of this sub-component is to improve the capacity of the the Directorate General of Water, Forests, and Hunting (DGEFC) to effectively execute its mandate, including establishing, managing and monitoring implementation of management plans and detecting and responding to threats to project targeted GFs. The sub-component will reduce its scope by US\$ 4 million whereby all resources earmarked to support activities in sub-component 1.1.3. Capacity enhancement of the National Center for Remote Sensing (CENATEL²) for satellite monitoring will be cancelled. The project’s ISR in March 18, 2020, brought into attention that following a Presidential Decree endorsed after project effectiveness CENATEL was dismantled by the GoB to incorporate it as a unit under the DGEFC.

7. The sub-component 1.1. will finance: (i) technical assistance to: (a) take stock on the current degradation state of targeted GFs in order to elaborate forest cover maps; (b) conduct a socio-economic study of forest-dependent communities in the target zones; and (c) develop GF management plans; (ii) consultation and validation workshops of the management plans by key stakeholders; (iii) acquisition of patrolling equipment including vehicles and motorcycles to enhance the capacity of the decentralized technical forestry management unit staff (CTAF: Cellules Techniques d’Aménagement Forestier) to effectively implement project activities in selected GFs; and (iv) works for the rehabilitation of CTAFs working and living quarters including provision of electricity, water and internet connection for effective communication with other CTAFs in project zones and the central administration in Cotonou for timely coordination of interventions in GFs. In order to ensure a collective and concerted management of forest resources, an intersectoral consultation and participation framework of key stakeholders including but not limited to Environment, Agriculture, Energy, Land, Infrastructure, municipalities, and traditional authorities, will be put in place for decision making and participatory planning and sustainable management of forest resources.

8. The project will also work with the Government, through their Public Investment Program to: (i) to recruit employees in replacement to the aging Forestry Administration workforce due to retirement, and undertake recruitments to enhance the human resources capacity of DGEFC for regular forest monitoring; and (ii) provide additional payments to CTAF involved with project implementation. CTAF are civil servants recruited and paid by the Government with its recurrent budget. On top of their salaries, they will receive bonuses based on performance. These bonuses are financed through counterpart funds already

²CENATEL: Centre National de Télédétection



mobilized by the Government in a special account, through the national budget. There is no IDA money although this is key for project success.

Component 2. Sub-component 2.1. Promotion of agricultural intensification and agroforestry methods, current: US\$4.20 million, proposed: US\$2 million.

9. The sub-component aims to promote agricultural intensification and agroforestry methods in project targeted Gazetted Forests (GFs) in the center and south of the country with the aim of containing and/or reversing the trends of deforestation and forest degradation due to extensive agriculture. The sub-component will reduce its scope and only focus on agroforestry activities, removing the promotion of agricultural intensification activities. The name of the sub-component will therefore change to Promotion of agroforestry methods.

10. The sub-component will finance technical assistance to take stock of existing farmers in GFs and work with them to adopt agroforestry methods in dedicated zones in GFs. The sub-component will finance: (i) technical assistance in outlining and mapping the zones for authorized agroforestry in GFs, parceling the agroforestry plots that will be given to farmers; (ii) participatory and inclusive stakeholder consultation workshops to ensure agreement on the siting of the dedicated areas for agroforestry; (iii) provision of demarcation materials (posts, pillars, signs, panels, planting alignments) and their participatory installation with farmers to ensure ownership over the new zones.

11. The project will support adoption of agroforestry methods through a stocktaking of existing successful national and regionally employed agroforestry techniques in order to recommend those practices most suitable to the project's zones of intervention. In parallel, the project will pilot agroforestry methods currently supported in the North of Benin by a GIZ financed project (PROSol). The system consists of using local fertilizing plants (Mucuna and Angolan nuts) proven to effectively increase farm productivity. The GIZ project has developed training modules disseminated by local NGOs who train and accompany farmers in the use of these techniques. The project will provide farmers with Mucuna and Angolan nuts seeds as well as forestry seeds adapted to the project agro-ecological zones, including acacia and teak seeds, to be introduced in their farms.

12. To facilitate the implementation of this sub-component, the project will collaborate with agroforestry NGOs to provide technical assistance to farmers and ensure successful implementation of the systems.

Sub-component 2.3. Sustainable management of Conservation forests, US\$ 2.5 million, cancellation.

13. The objective of this sub-component is to dedicate 40 percent of selected GFs under conservation to ensure natural or assisted regeneration of tree species and concomitantly restore habitats conducive to increased biodiversity. The sub-component will be cancelled.

Sub-component 2.4. Establishment and management of production forests, current: US\$49.7 million, proposed: US\$46.20 million.

14. The sub-component will finance the establishment of sustainably managed fuelwood production forests, with the objective of contributing to the energy demand from Benin major consumption cities (Cotonou, Abomey-Calavi and Porto-Novo). The sub-component will reduce its scope by US\$3.5 million whereby resources that were planned to outsource Forest Surveillance will be cancelled.

15. The project will develop a total of 15,000 hectares of *Acacia auriculiformis* fuelwood plantations. Farmers settled in GFs will be authorized to implement the agroforestry taungya system and will be incentivized through performance-based with the project to participate in plantation works from nursery establishment to planting and maintenance of the acacia plantations. Pastoralists will be equally involved in this incentive mechanism, as the project will call on draft animals both during plantation preparation (to transport seedlings) and harvest time (to transport fuelwood loads to points of sale, i.e. rural wood markets (MRB: Marchés Ruraux de Bois). This integrated and participative "win-win" situation for local communities will not only



provide alternative income streams, but it will also make them key players in sustainable gazetted forest management. It will also contribute to addressing transhumance in GFs as pastoralists become key actors in forest management.

16. The incentive mechanism will be governed by a performance-based contract between the Integrated Project Management Unit (IPMU) and the farmers. Payments will be triggered by: (i) the number of seedlings developed in the nursery by the farmers; (ii) the number of trees planted and the percentage of success; (iii) the effective maintenance of trees planted, etc. For the pastoralists, the performance will be measured by: (i) the number of seedlings transported to plantation sites and effectively distributed to farmers for planting; (ii) ensuring non-destruction of plantations by pastoralists; (iii) the number of loads transported to points of sale after harvests, etc. Verification of the performance will be ensured preliminarily by the CTAFs, who are located in the rural areas close to farmers. The performance verification will be done by the independent NGOs and will be reported to the IPMU. Payments will be made in installments in the form of subgrants based on this dual verification protocol; a payment agency will be recruited prior to disbursement of subgrants to the beneficiaries.

17. The establishment of the plantations will be supported by the following preparatory activities: (i) an analytical study to: (a) ascertain soil quality in potential plantation areas in selected GFs, (b) identify, survey, and map potential plantation sites and parcels for selected species; and (ii) establishment of community-led nurseries for the production of the selected species.

18. The project will finance establishment of fire breaks (manual and/or vegetative) around the Acacia plantations and ensure close monitoring during their first three years of development, when they are most sensitive to bush fires. Viewing platforms near plantations, water trucks and fire extinguishers will also be provided for quick intervention as needed. Technical specification sheets to guide the implementation and management of Acacia plantations will be developed by DGEFC prior to launching of the plantation establishment during the second year of the project.

19. The sub-component will also support strengthening and scaling-up of rural wood markets, the sale points of wood harvested from the plantation through: (i) a stocktaking of existing MRBs (MRB: Marchés Ruraux de Bois in French) which will report (i) achievements, best practices, challenges, and potential failures of the system; (ii) capacity building of GF co-management committees responsible for managing the MRBs in best practices and business management principles and simplified accounting methods; and (iii) acquisition of equipment for the establishment and furnishing of offices in new MRBs, including office supplies such as registers, receipts, notebooks, and other materials necessary for proper recordkeeping.

20. The sub-component will also finance the establishment of 7,000 hectares of Teak plantations in two GF (Toffo and Dogo) given the high economic value of this tree species compared to Acacia. These plantations will be done by ONAB based on their experience and track record in timber production and management. Revenues generated from teak will contribute to the management and maintenance costs of the Acacia plantations after project closure. It was agreed that 10 to 15% of profits generated from the sales of timber will be earmarked for this purpose and transferred to the sustainability instrument (GF account at FSOA or in the NFF) to be selected by mid-term review. The remaining profits will cover renewal of the plantations and related maintenance and overhead costs.

Component 3. Sub-component 3.1. Development of Shea value chain, US\$2.9 million, cancellation.

21. The objective of this sub-component is to develop Shea value chain, promoting energy-efficient processing methods, the establishment of 1,500 has of new shea plantations to replace the aging and less productive trees. The sub-component will be cancelled.

22. **Results Framework.** The proposed cancellation and reduction of scope of selected components and sub-components will impact the Results Framework whereby intermediate indicators and targets will be updated. The main proposed changes to budgets and Results Framework are summarized in the table 1 and 2 below, for a more detailed description see the Results Framework in the annex.

Table 1. Project components, sub-components, current and revised budgets.



Component and sub-components	Current Budget (US\$ million)	Revised Budget (US\$ million)
Component 1: Support to Forest Governance	9.77	5.77
Sub-comp 1.1. Capacity enhancement of the Forestry Administration	8.59	4.59
Sub-comp. 1.1.2: Capacity enhancement of CTAF for improved GF management	4.59	4.59
Sub-comp. 1.1.3 Capacity enhancement of CENATEL for satellite monitoring	4.00	Cancel
Sub-comp 1.2: Strategies and Instruments for sustainable GF management	1.18	1.18
Component 2: Integrated GF management	57.21	49.01
Sub-comp 2.1: Promotion of agricultural intensification and agroforestry methods	4.20	2.00
Sub-comp 2.2: Sustainable management of transhumance	0.81	0.81
Sub-comp 2.3: Sustainable management of Conservation forests	2.50	Cancel
Sub-comp 2.4: Establishment & management of production forests	49.70	46.20
Component 3: Development of selected NTFP	4.10	1.20
Sub-comp 3.1: Development of Shea Value Chain	2.90	Cancel
Sub-comp 3.2: Development of Honey Value Chain	1.20	1.20
Component 3: Project Management	3.90	3.90
Total	75	60

Table 2. Results Framework, selected indicators, current and revised targets.

Indicator Type	Current target	Revised target	Comment
PDO Indicators			
PDO Indicator 4: Communities adjacent to targeted GFs with increased access to income sources through NTFP value chains (Number)	1,000	800	Sub-component 3.1. "Development of Shea value chain" is proposed to be cancelled., the number of overall targeted beneficiaries will be reduced by 200.
Component 2: Integrated Management of Gazetted Forests			
Intermediate Indicator 5: Farmers adopting improved agricultural technology (Number)	2,000	Cancel	Agriculture intensification activities are proposed to be cancelled under sub-component 2.1. "Promotion of agricultural intensification and agroforestry methods"
Intermediate Indicator 6: Surface areas brought under enhanced biodiversity conservation (Hectare(Ha))	367,180	Cancel	Sub-component 2.3. "Sustainable management of conservation forests" is proposed to be cancelled.
Component 3: Development of Selected Non-Timber Forest Product Value Chains			
Intermediate Indicator 12: Shea trees established and managed in and around targeted GF in the north (disaggregated by GF) (Hectare(Ha))	1,500	Cancel	Sub-component 3.1. "Development of Shea value chain" is proposed to be cancelled.
Intermediate Indicator 13: Women shea nut collectors organized and producing energy-efficient shea butter for national and regional sale (Number)	200	Cancel	Sub-component 3.1. "Development of Shea value chain" is proposed to be cancelled.

23. **Economic and Financial Analysis.** proposed cancellation of selected sub-components will impact the Economic Analysis, see Annex 1 for an updated analysis. Results of the economic analysis show positive outcomes for the project. A summary of economic simulations is summarized in the table below. The table shows the NPV, benefit-cost ratio and IRR (selected interventions) for various discount rates, carbon prices scenario and variations of benefits, including for simulations without carbon benefits. The sensitivity analysis demonstrates strong economic results, even when tangible benefits are accounted for,



under various discount rates. It should be noted that the fuelwood subcomponent demonstrated overall efficiency only in the case of charcoal production, compared to the returns generated as a result of fuelwood sale.

Table 3. Summary of Sensitivity Analysis

	All Benefits with low carbon price			All Benefits with high carbon price			Benefits except carbon and soil benefits			50% Benefits and low carbon benefits		
	5	10	20	5	10	20	5	10	20	5	10	20
Discount rate, %												
NPV, US\$M	707	424.8	191.2	1,084.70	674.8	327.5	126.9	57.1	7.8	518	316.9	148.6
B/C ratio	14.6	10.6	6.7	22.2	16.6	11.1	3.3	2.1	1	11.1	8.3	5.6
IRR, %							18	13	4			

III. SUMMARY OF CHANGES

	Changed	Not Changed
Results Framework	✓	
Components and Cost	✓	
Cancellations Proposed	✓	
Reallocation between Disbursement Categories	✓	
Disbursement Estimates	✓	
Economic and Financial Analysis	✓	
Implementing Agency		✓
DDO Status		✓
Project's Development Objectives		✓
PBCs		✓
Loan Closing Date(s)		✓
Disbursements Arrangements		✓
Overall Risk Rating		✓
Safeguard Policies Triggered		✓
EA category		✓
Legal Covenants		✓
Institutional Arrangements		✓



Financial Management		✓
Procurement		✓
Implementation Schedule		✓
Other Change(s)		✓
Technical Analysis		✓
Social Analysis		✓
Environmental Analysis		✓

IV. DETAILED CHANGE(S)

COMPONENTS

Current Component Name	Current Cost (US\$M)	Action	Proposed Component Name	Proposed Cost (US\$M)
Support to Forests Governance	9.77	Revised	Support to Forests Governance	5.77
Integrated Management of Gazetted Forests	57.20	Revised	Integrated Management of Gazetted Forests	49.01
Development of Selected NTFP Value Chains	4.10	Revised	Development of Selected NTFP Value Chains	1.22
Project Management	3.90	No Change	Project Management	3.90
TOTAL	74.97			59.90

CANCELLATIONS

Ln/Cr/Tf	Status	Currency	Current Amount	Cancellation Amount	Value Date of Cancellation	New Amount	Reason for Cancellation
IDA-D4770-001	Disbursing	XDR	54,100,000.00	10,820,000.00	01-Jul-2020	43,280,000.00	BORROWER'S REQUEST FOR COUNTRY REASONS

REALLOCATION BETWEEN DISBURSEMENT CATEGORIES



	Current Allocation	Actuals + Committed	Proposed Allocation	Financing % (Type Total)	
				Current	Proposed
IDA-D4770-001 Currency: XDR					
iLap Category Sequence No: 1		Current Expenditure Category: GDS,WKS,NCS,CS,OC,TR			
	43,200,000.00	1,509,549.32	32,380,000.00	100.00	100.00
iLap Category Sequence No: 2		Current Expenditure Category: SUBGRANTS UNDER P2.4(iii)			
	10,900,000.00	0.00	10,900,000.00	100.00	100.00
Total	54,100,000.00	1,509,549.32	43,280,000.00		

DISBURSEMENT ESTIMATES

Change in Disbursement Estimates

Yes

Year	Current	Proposed
2019	0.00	0.00
2020	5,480,197.00	5,480,197.00
2021	7,944,356.00	5,944,356.00
2022	9,528,103.00	6,528,103.00
2023	10,722,893.00	9,722,893.00
2024	14,897,686.00	12,897,686.00
2025	15,758,485.00	10,758,485.00
2026	7,454,680.00	5,454,680.00
2027	3,213,600.00	3,213,600.00



Results framework

COUNTRY: Benin

Gazetted Forests Management Project

Project Development Objectives(s)

To improve the integrated management of targeted Gazetted Forests, to increase access of the main consumption cities to fuelwood produced sustainably, and to strengthen selected non-timber forest product value chains for forest-dependent communities

Project Development Objective Indicators by Objectives/ Outcomes

Indicator Name	PBC	Baseline	End Target
Improve integrated mgmt of GFs; increase access to sust. fuelwood; strengthen NTFP value chains			
PDO Indicator 1: Gazetted Forest areas under sustainable management based on defined criteria (Hectare(Ha))		8,909.00	917,951.00
PDO Indicator 2: Net greenhouse gas emissions (Metric ton)		0.00	12,600,000.00
PDO Indicator 3: Standing volume of wood energy plantations (Cubic Meter(m3))		10,800.00	1,810,800.00
PDO Indicator 4: Communities adjacent to targeted GFs with increased access to income sources through NTFP value chains (Number)		0.00	800.00
Action: This indicator has been Revised			
PDO Indicator 5: Satisfaction of beneficiaries (level of engagement, by gender and age) (Percentage)		0.00	70.00



Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline	Intermediate Targets							End Target
			1	2	3	4	5	6	7	
Component 1: Support to Forests Governance										
Intermediate Indicator 1: Forest area brought under management plans (Hectare(Ha))		0.00	0.00	124,981.00	384,951.00	897,451.00	917,951.00	917,951.00	917,951.00	917,951.00
Intermediate Indicator 2: Areas of GF patrolled by the forest rangers (Square kilometer(km2))		883.00	883.00	2,651.00	5,302.00	7,983.00	7,983.00	7,983.00	7,983.00	7,983.00
Intermediate Indicator 3: Improved organizational arrangements for GF submitted to the Government for adoption (Yes/No)		No	No	No	No	Yes	Yes	Yes	Yes	Yes
Intermediate Indicator 4: Financial instrument selected to finance recurrent costs of GF management in the long run (Yes/No)		No	No	No	No	Yes	Yes	Yes	Yes	Yes
Component 2: Integrated Management of Gazetted Forests										
Intermediate Indicator 5: Farmers adopting		0.00	0.00	0.00	600.00	1,000.00	1,500.00	2,000.00	2,000.00	2,000.00



The World Bank

Gazetted Forests Management Project (P167678)

Indicator Name	PBC	Baseline	Intermediate Targets							End Target
			1	2	3	4	5	6	7	
improved agricultural technology (Number)										
Action: This indicator has been Marked for Deletion										
Intermediate Indicator 6: Surface areas brought under enhanced biodiversity conservation (Hectare(Ha))		88,377.00	88,377.00	88,377.00	150,000.00	200,000.00	250,000.00	367,180.00	367,180.00	367,180.00
Action: This indicator has been Marked for Deletion										
Intermediate Indicator 7: Transhumance corridors created by the project (Number)		1.00	1.00	3.00	5.00	7.00	9.00	10.00	11.00	11.00
Intermediate Indicator 8: Producers adopting improved carbonization techniques (Number)		0.00	0.00	0.00	0.00	100.00	200.00	250.00	300.00	300.00
of which women (Number)		0.00	0.00	0.00	0.00	50.00	100.00	150.00	200.00	200.00
Intermediate Indicator 9: Plantations of wood energy established and		90.00	290.00	2,440.00	4,890.00	7,340.00	9,490.00	12,090.00	15,090.00	15,090.00



The World Bank

Gazetted Forests Management Project (P167678)

Indicator Name	PBC	Baseline	Intermediate Targets							End Target
			1	2	3	4	5	6	7	
managed (disaggregated by GF) (Hectare(Ha))										
Dan (Hectare(Ha))		35.00	235.00	535.00	835.00	1,035.00	1,235.00	1,235.00	1,235.00	1,235.00
Ketou (Hectare(Ha))		45.00	45.00	445.00	945.00	1,545.00	2,045.00	2,545.00	3,045.00	3,045.00
Logozohe (Hectare(Ha))		0.00	0.00	250.00	500.00	800.00	1,100.00	1,300.00	1,300.00	1,300.00
Oueme-Boukou (Hectare(Ha))		10.00	10.00	510.00	1,110.00	1,710.00	2,210.00	2,510.00	3,010.00	3,010.00
Tchaourou-Toui- Kilibo (Hectare(Ha))		0.00	0.00	500.00	1,100.00	1,700.00	2,400.00	2,900.00	3,500.00	3,500.00
Agoua (Hectare(Ha))		0.00	0.00	200.00	500.00	800.00	1,000.00	2,000.00	3,000.00	3,000.00
Intermediate Indicator 10: Surface areas granted to farmers to apply the taungya system (Hectare(Ha))		0.00	0.00	0.00	1,000.00	2,000.00	3,500.00	5,000.00	5,000.00	5,000.00
of which women (Hectare(Ha))		0.00	0.00	0.00	500.00	1,000.00	1,500.00	2,500.00	2,500.00	2,500.00
Intermediate Indicator 11: Plantations of timber established and managed (disaggregated by GF) (Hectare(Ha))		805.00								7,805.00
Dogo (Hectare(Ha))		805.00	1,555.00	2,305.00	3,055.00	3,805.00	4,805.00	5,805.00	5,805.00	5,805.00



The World Bank

Gazetted Forests Management Project (P167678)

Indicator Name	PBC	Baseline	Intermediate Targets							End Target
			1	2	3	4	5	6	7	
Toffo (Hectare(Ha))		0.00	0.00	300.00	600.00	900.00	1,200.00	1,600.00	2,000.00	2,000.00
Component 3: Development of Selected Non-Timber Forest Product Value Chains										
Intermediate Indicator 12: Shea trees established and managed in and around targeted GF in the north (disaggregated by GF) (Hectare(Ha))		0.00	0.00	0.00	200.00	550.00	950.00	1,150.00	1,500.00	1,500.00
Action: This indicator has been Marked for Deletion										
Trois Rivières (Hectare(Ha))		0.00	0.00	0.00	50.00	150.00	250.00	300.00	400.00	400.00
Action: This indicator has been Marked for Deletion										
Alibori Supérieur (Hectare(Ha))		0.00	0.00	0.00	50.00	150.00	250.00	300.00	400.00	400.00
Action: This indicator has been Marked for Deletion										
Ouémé Supérieur Ndali (Hectare(Ha))		0.00	0.00	0.00	50.00	150.00	250.00	300.00	400.00	400.00



The World Bank

Gazetted Forests Management Project (P167678)

Indicator Name	PBC	Baseline	Intermediate Targets							End Target
			1	2	3	4	5	6	7	
Action: This indicator has been Marked for Deletion										
Ouenou-Benou (Hectare(Ha))		0.00	0.00	0.00	50.00	100.00	200.00	250.00	300.00	300.00
Action: This indicator has been Marked for Deletion										
Intermediate Indicator 13: Women shea nut collectors organized and producing energy-efficient shea butter for national and regional sale (Number)		0.00	0.00	0.00	0.00	50.00	150.00	200.00	200.00	200.00
Action: This indicator has been Marked for Deletion										
Intermediate Indicator 14: Honey producers organized and producing honey for national and regional sale (Number)		0.00	0.00	0.00	0.00	50.00	150.00	200.00	200.00	200.00



The World Bank

Gazetted Forests Management Project (P167678)

Click here to enter text.



Annex 1: Economic Analysis

1. The proposed cancellation of selected sub-components will impact the results of the project economic analysis. The original project appraisal document describes the approach and methodology, therefore this annex will focus on changes and updated results.
2. Economic analysis focuses only on selected benefits for the assessment of project feasibility due to lack of data ex-ante: selected environmental benefits (watershed value) derived from the sustainable forest management, assessment of the benefits from development of timber and fuelwood plantations mainly focusing on charcoal production and taungya farming benefits, benefits derived from the NFTP value chain development (assessment of the revenue of honey production), and emission reduction/carbon sequestration benefits. Other benefits are discussed in a qualitative analysis.
3. The project’s direct measurable benefits will be delivered via components 2 and 3 of the project:
4. Sub-component 2.4: Establishment and management of production forests. The objective of this component is to establish and manage fuelwood plantations to supply major consumption hubs (Cotonou, Abomey-Calavi and Porto-Novo). The project will develop 15,000 ha of Acacia auriculiformis plantations, a fuelwood tree species known not only for its rapid growth, but also for its soil fertility enhancing qualities. These soil fertility qualities will enable successful application of the taungya system of intercropping—with agricultural crops such as maize, peanut, soya interspersed among acacia trees – on 5,000 ha of acacia plantation.
5. Sub-component 2.4: Establishment and management of production forests. This subcomponent will also finance establishment of 7,000 hectares of teak plantation in two GFs (Toffo-Lama Sud and Dogo) given the high economic value of this tree species compared to acacia. These plantations will be done by ONAB based on their experience and track record in timber production and management.
6. Sub-component 3.2: Development of a honey value chain. This sub-component aims at supporting the development of an acacia honey value chain from the 15,000 hectares acacia plantations installed by the project to provide alternative revenues to forest-dependent communities.
7. A matrix of project benefits was built based on the example of the WB forestry operations, including Forest Investment Program in Cote d’Ivoire, as an overview of four categories benefits associated with the project.

Table 1: Economic benefits generated by the project

	Tangible	Intangible
Direct	Climate benefits: reduction of GHG emissions, increased carbon sequestration capacity Increased revenue from timber production (7,000 ha timber plantations) Revenue from fuelwood plantations (15,000 ha): income increase for local population engaged in nurseries, plantations works; revenues from the organized markets and woof fuel sales Revenue from yield from agricultural crops during the early stages of forest plantation establishment (Taungya	Reduction in soil erosion, improved of soil quality as a result of sustainable management of GF Reduction in deforestation in GF Afforestation/reforestation Reduction of farmer-herder conflicts as a result of enhanced management of transhumance corridors in target zones Increased watershed value as a result of forestry management and transhumance Recreational: eco-tourism and recreation areas, including urban parks Poverty reduction



	<p>system, assumption is maize based) (not included in the analysis)</p> <p>NFTP: increased income as a result of the value chain development for honey, increased income as a result of the income generating activities supported by the project</p> <p>Transhumance: economic benefits from cattle production (not included in the quantitative analysis due to lack of data)</p>	
Indirect	<p>Reduced pressure on Gazetted Forests</p> <p>Increased resilience to climate change/adaptation</p> <p>Developed/improved value chains for NFTP</p>	<p>Enhanced policy and regulations in GF management.</p> <p>Improved management of the GF: reduced illegal harvesting, reduced bushfires, reduced uncontrolled production of firewood and charcoal, sustainable use of fertilizers and pesticides as a result of agroforestry techniques</p> <p>Improved markets of NFTP</p>

Project area under economic analysis

8. The project targets different ecosystems, and their assessment is important for identification and valuation of the benefits generated by project interventions. 11 forest reserves have been targeted for project interventions on the basis of their conservation, production and NTFP development potentials. Four are in the south (Dan, Dogo-Kétou, Logozohè and Toffo), three in the center (Agoua, Ouémé-Boukou, and Tchaourou-Toui-Kilibo) and four in the north (Ouémé-Supérieur-Ndali, Alibori Supérieur, Trois Rivières, and Ouénou-Bénou) of the country. The total surface of these GFs is 917,951 hectares representing 63 percent of the total surface (1,457,247 ha) of the Country’s 46 GFs.

9. The project interventions in the southern and central GFs will be focused on the establishment of large-scale fuelwood plantation activities, including 15,000 ha of acacia plantations and 7,000 ha of high-quality teak timber plantations. In addition, a honey value chain will be supported in these areas as well.

Main assumptions

10. A cost-benefit-analysis was applied to assess the economic efficiency of this project. A sensitivity analysis was conducted for the main parameters including discount rate. For the discount rate, alternative rates of 5 percent, 10 percent, and 20 percent were applied. To test the robustness of initial results the economic benefits were reduced by 50 percent and lower:

a) for fuelwood plantation 15,000 ha, the assumption was made that the first benefits will arrive in year six of the project, The Mean Annual Increment (MAI) - average volume of wood growing on one hectare of forest plantation during one year – was taken into account to calculate benefits associated with fuelwood production.

b) for crop production using taungya system – the assumption was made that the maize will be harvested on 5,000 ha of acacia plantation during first three years after fuelwood harvest.



c) for timber plantation 7,000 ha - the estimated sales during 20 years of plantation life were included (two thinning cycles³). The revenues are estimated at US\$79.1 million over a period of 23 years based on total production of 42 m³/ha (294,000 m³) and sold at US\$269/m³. Revenue as a result of thinning was considered in the analysis (year 7 and 14, based on ONAB data).

d) for production of honey, the assumption was made that the first harvest will be made in year six of the project, assuming that capacity building and management plans will be developed during the first few years of project implementation, and considering the growth period of the Acacia trees on the new plantation. Average yield was considered, under the assumption of intermittent growth (fuelwood harvest and taungya).

11. A carbon price is applied in the subsequent analysis. All sensitivity analyses were run for all discount rate scenarios. The results of the quantitative results are complemented with description of qualitative benefits to conclude overall project feasibility.

12. An assessment of climate benefits considered incremental sequestered carbon and storage as a result of direct interventions during the project life of 20 years, without accounting for the additional benefits resulting from the improved forestry management. In addition, carbon benefits delivered by the agroforestry interventions were not accounted for here due to the on-demand nature of this subcomponent.

Project duration and time

13. Project duration is seven years. The “with-project”, with carbon benefits and “without- project” situations were compared over the lifetime of investments made to promote the green economy, i.e. the project life estimated at 20 years. In total, the project will generate net emissions reductions of 12.6 million tons tCO₂-eq over a period of 20 years.

14. The shadow price of carbon was calculated based on the WB guidance document⁴ (2017). As recommended in the guidance document, the scenarios considered in the economic analysis were done both with and without the shadow price of carbon, to reflect the local and global impacts of the project. In line with the High-Level Commission on Carbon Prices⁵, this guidance note recommends that the project’s economic analysis use a low and high estimate of the carbon price starting at US\$40 and US\$80, respectively, in 2020 and increasing to US\$50 and US\$100 by 2030. Beyond 2030 the guidance note recommends that the low and high values on carbon prices are extrapolated from 2030 to 2050 using the same growth rate of 2.25 percent per year that is implicit between the 2020 and 2030, leading to values of US\$78 and US\$156 by 2050.

Poverty alleviation

15. Following definitions provided in the PEN study⁶ the project targets environmental forest income and timber plantation, including portions of the income from crop production focused on the taungya, agroforestry and NFTP. According to the PEN study findings, the share of forest income (natural forest and plantation) is 21.4 percent in the Africa region⁷; crop income is 32.2 percent but does not specify the share of the agroforestry. If the project reaches its objective, it will increase the size of the forest income - one of the largest shares of the household income in targeted areas. An increase in forest income by 15 percent will result in an increase of total household income at 6 percent for forest dependent communities of the project targets GFs, a population of about 536,368 (68,954 households) of which 267,626 men and 268,204 women. An assessment of the livelihood impacts was made by using the following assumptions: rural per capita income of at least 70 percent of the reported per capita income (2016) US\$820, incremental benefits at a highly conservative one percent⁸ increase (vs estimated 6 percent) received by

³ Data from the local office of ONAB

⁴ 2017. World Bank. Guidance note on shadow price of carbon in economic analysis. Washington DC

⁵ https://static1.squarespace.com/static/54ff9c5ce4b0a53deccfb4c/t/59244eed17bffc0ac256cf16/1495551740633/CarbonPricing_Final_May29.pdf

⁶ Study conducted by the CIFOR’s Poverty Environment Network (PEN) 2014. Angelsen A, et al. Environmental Income and Rural Livelihoods: A Global-Comparative Analysis. World Development Volume 64, Supplement 1, December 2014

⁷ Stallholder-dominated tropical and subtropical landscapes with moderate-to-good access to forest resources

⁸ Income increase in 6 percent is an optimistic assessment, considering successful and timely implementation of project component, value chain for NFTP built and



the project beneficiaries (US\$5.7). The results of the incremental benefits stream to the project beneficiaries over the project life is demonstrated in table 2.

Table 2: Project livelihood incremental benefits

project life	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
project beneficiaries	76.6	76.6	76.6	76.6	76.6	76.6	76.6	0	0	0	0	0	0	0	0	0	0	0	0	0
cumulative beneficiaries, thousand	76.6	153.2	229.9	306.5	383.1	459.7	536.4	536.4	536.4	536.4	536.4	536.4	536.4	536.4	536.4	536.4	536.4	536.4	536.4	536.4
Incremental Benefits, US\$ thousand	439.8	879.6	1,319.5	1,759.3	2,199.1	2,638.9	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8	3,078.8

16. These incremental benefits are calculated based on a conservative assumption. However, considering that project interventions under components 2 and 3 will be implemented by the communities of the selected GFs, including site preparation, establishment of the nurseries, maintenance of the plantations, fuelwood harvest, carbonization, NFTP – expected benefits stream will provide full employment and income generation for the communities during the project life, and beyond.

Biodiversity and Watershed Values

17. Forests within the GFs provide valuable benefits in terms of habitats for biodiversity, water protection, erosion control and soil preservation. A recent study of the hydrological status of Ouémé basin⁹ demonstrated that current water availability does not meet the annual needs of the population, and soil losses are an important factor in water availability. The agro-hydrological model SWAT confirmed the soil losses are important in the basin since direct measurements reported huge losses in agricultural areas. Project interventions will directly contribute to the reduction of soil loss and erosion prevention.

18. Given the importance of forests in preservation and restoration of the hydrological balance, watershed values were considered in the quantitative economic analysis. Cote d'Ivoire Forest Investment Program (FIP) economic analysis referred to several assessment studies on accounting forests value, including TEEB (2009) valuing intact tropical forests as US\$6,120 ha/year, Pearce (2001) watershed value at a range between US\$15 and US\$850 ha/year with the higher value of tropical forests. The World Bank¹⁰ estimates watershed values at US\$129/ha for developed and US\$27ha/year in developing countries. In the case of this project, the conservative approach was applied, with the value of US\$27/ha/year, considering the area of the gazetted forests under sustainable management (917,951 ha), assuming benefits as a result of the sustainable management.

19. Under various discount rates, improved forestry management and governance, and sustainable management of the gazetted forests, results in a positive NPV, even under a conservative watershed value of US\$27/ha/year¹¹:

Table 3. Watershed Values discounting

Discount rates, percentage	5	10	20
NPV, US\$M	173.1	94.7	32.0
IRR, percent	50%	43%	31%
B/C ratio	18.4	12.3	6.1

charcoal sales at the urban market prices

⁹ 2014. Sintondji Luc Ollivier 1*, Zokpodo Barnabé 1, Ahouansou D. Maurice 1, VISSIN W. Expédit 2, Agbossou Kossi Euloge. Modelling the water balance of Ouémé catchment at the Savè outlet in Benin: contribution to the sustainable water resource management. International Journal of AgriScience Vol. 4(1): 74-88, January 2014 ISSN: 2228-6322© International Academic Journals

¹⁰ The Changing Wealth of Nations – Measuring Sustainable Development in the New Millennium (2011)

¹¹ This analysis considered that component 1 Support to GF Governance and subcomponent 2.3 Sustainable management of Conservation forests will result in increased conservation value of the forest.



Baseline

20. The direct drivers of deforestation and forest degradation in the GFs are: (i) the extensive and shifting slash and burn agriculture; (ii) bushfires (accidental or intentional, for agriculture or hunting); (iii) uncontrolled production of firewood and charcoal, on which 80 percent of the population depend for cooking; (iv) unsustainable production and harvesting of timber for local consumption and export; (v) seasonal transhumance of local and foreign herds in search of pasture and water in the GFs; (vi) urban encroachments in the GFs adjacent to cities, a minor factor in the past, now growing, (vii) installation of dwellings of local residents and migrant agricultural settlers inside GFs, with the emergence of related infrastructure (boreholes, roads, electricity, telephone cables); and (viii) large-scale use of herbicides and pesticides, a new and fast-growing factor, also threatening forest cover and biomass.

Fuelwood

21. The objective of this component is to reverse the trend of unrestrained collection of fuelwood in GFs by establishing fuelwood plantations to supply major city centers (Cotonou, Porto-Novo, Abomey-Calavi, Parakou). The project will develop 15,000 ha of the acacia plantation during the implementation period, in selected GFs. The management and exploitation of these plantations can be ensured in two ways: (i) concessions to private operators or local associations or (ii) delegated management to local communities.

22. Nurseries for the production of fast-growing local species will be established and managed by local communities with technical assistance from the Forestry Administration. The following interventions will also be financed: (i) reinforcement of the Forestry Administration's control and supervision over fuelwood production, before and after cuts; (ii) reorganization of existing rural wood markets and creation of new ones, as necessary; (iii) training of charcoal producers in improved carbonization techniques and provision of higher performance furnaces; (iv) development and implementation in each GF of a fuelwood development plan to ensure sustainable harvesting in natural forest (plots, harvestable volumes, species and diameters); and (v) the development of an effective incentive-based tax system without adverse effects, and enforceable by the Forestry Administration.

23. The general idea behind the taungya system is to simultaneously plant agricultural crops and trees at the same area and let it grow until the tree canopy closes.

24. Assumptions for the economic analysis are based on the visit made during the project preparation mission to the Pahou, Acacia fuelwood plantation. Considering project interventions in charcoal production, it was assumed that 100 percent of the wood output will be used for charcoal production. The following growth and market characteristics were considered:

Planting density 1,111 trees per ha

Mean Annual Increment (MAI) (average) 16 m³/ha/year¹²

Rotation Length 5-6 years (acacia)

Average price of CFA5,500 per m³ fuelwood

Yield - 80 m³ of fuelwood from one ha plantation

One sack/bag charcoal (weight 60) kg, price per bag 2,500 (US\$4) FCFA in rural areas, and CFA 7,000 (US\$12.3) in urban centers

Charcoal production – 10 m³ of the fuelwood in average is used in producing one ton (1 000 kg) of (7 to 11 m³ (solid))¹³; regional data referenced to yield of 300 bags of charcoal from ha of the acacia plantation

Taungya method – various crops will be planted by farmers, however maize yield and price were applied in the analysis on 5,000 ha; maize will be planted during three years after fuelwood harvest.

¹² The Mean Annual Increment (MAI) is the volume of wood growing on one hectare of forest plantation during one year, on average, since the establishment of the forest plantation. This is expressed in m³/ha/year. Default values are estimated using average values from existing literature at the global level. For calculation purposes, the MAI is defined as the merchantable stand volume at harvesting time divided by the rotation length (2014. FAO. Natural Resources Module. Woodfuel and Wood Residues Component)

¹³ 1983. FAO. Simple technologies for charcoal making. Link: <http://www.fao.org/docrep/x5328e/x5328e00.htm#Contents>



25. For project purposes, it was assumed that there would be no expansion in the planted area, only replanting of harvested areas. The management systems included in the analysis have been chosen as the most common systems in forest plantation for bioenergy purposes. Moreover, it is assumed that trees are not thinned or pruned in the default profiles. The analysis focuses on productive plantations, excludes protective plantations and semi-natural planted forests. The calculations are made before tax, without including rent. There is a significant difference in the scenario’s fuelwood sale and charcoal production with the taungya approach, as under the first scenario (fuelwood sale) intervention is not economically viable. Table 4 below provides a summary of the assessment taking into account the described assumptions:

Table 4. Assessment of Fuelwood Benefits

	Charcoal production, 15,000 acacia, taungya system (maize)			Fuelwood production and sale, 15,000 acacia, taungya system (maize)		
Discount rate, percentage	5	10	20	5	10	20
NPV, US\$ M	56.3	21.5	6.2	3.1	5	-7.4
IRR, percentage	22	15	7	2	-5	-11
B/C ratio	3.1	1.9	1.2	1.0	0.6	0.4

Timber plantation

26. Economic analysis is based on the data for teak plantations. *Tectona grandis* (teak) is a deciduous hardwood tree, it is in high demand for its qualities: its wood is weather and pesticide resistant because of the natural oils that are contained within its fibers; it is very attractive and used of the interior designs as well. The environmental impact of sustainable teak production is low due to low susceptibility to diseases.

27. Main inputs for the analysis were as follows: a) new teak plantations 7,000 ha established under the project, b) the project life 20 years, c) yield and pricing based on the interview with ONAB and FAO estimates; d) discount rates 5 percent, 10 percent, 20 percent. Results and inputs are in the tables below.

28. Revenue received as a result of thinning was considered to calculate NPV at years 7 and 14 of the project, and based on the average plantation growth (Mean Annual Increment Average).

Table 5. Summary of economic analysis

Discount rate, percentage	5	10	20
NPV, US M	12.7	-	-
IRR, percentage	5.0	-	-
BC ratio	2.8	1.4	<1

29. No chemical treatments are required for pest control because of the low susceptibility of teak to diseases. Therefore, no ecological damage is caused to the environment, and was not factored in the analysis. Also, the spread of teak outside the plantation can easily be controlled, since dispersal distance of teak seeds is limited¹⁴. Teak cannot invade areas with dense (high grass) vegetation without human interference because it is a high light demanding species. The presence of buffer strips and fire outbreaks around the plantation inhibits the spread of teak outside plantation boundaries. Most areas surrounding the plantation are in agricultural use for which teak poses no threat¹⁵.

¹⁴ FAO 2010

¹⁵ http://www.formghana.com/login/upload/FORM_Ghana_VCS_Project_Description_20130114.pdf



30. For the assessment of economic benefits it was considered that teak plantations are managed as even-aged stands with a rotation cycle of 20-30 years and two intermediate thinnings during first 20 years of planting. This choice is based on economic and silvicultural considerations.

Justification for the public sector financing:

31. Less than 20 years rotation teak is not competitive in the traditional forest teak market where natural plantations and longer rotation trees (at least 30 and older) are in the higher demand. These activities, even for the short rotation plantation, require a long investment horizon, higher upfront investments to set up and maintain plantation in the first 7 years (land preparation, weeding, thinning, capital-intensive planting, etc). Most of the return (due to the higher price for older trees, lower maintenance for the older plantation) is expected at the end of the rotation, and most labor intensive operations/maintenance to ensure survival rate and higher quality wood is conducted in the first decade of plantation life cycle. Private financial products are not well matched to such long-term funding. Major positive cash flow is expected by second or third thinning (12 or 16 years of plantation life cycle) (FAO 2010).

Non-Timber Forests Products (NTFP)

32. Recent studies from the region found NFTP to be an important source of income source for the households, however there are no relevant studies assessing all elements of the rural household income. In the various case studies, NFTP income contribution in the household income vary between 10-27 percent in Malawi (wild and planted fruit trees)¹⁶, Congo (wild plants)¹⁷ and Ethiopia (various NFTP, including fuel wood)¹⁸. Assessment of the NFTP input in household income¹⁹ in Benikoara municipality, Benin demonstrated that NFTP (mainly mushrooms and wild fruits) contributes on average 11.45 percent of the household's total annual income (FCFA 255,484 or US\$ 448 per year)²⁰. A study conducted in northern Benin²¹ (Papatia and Chabi-Couma, Department of Atakora) estimates that on average, 39 percent of annual income is generated by diverse NTFPs. The findings of the PEN study demonstrate that the share of NFTP income in the total forest income globally reaches over 35 percent, and 30 percent in Africa.

33. Studies referenced above (PEN (2010), Heubach et al (2011)) found that the economic significance of NTFPs differs between households: the lower the total household income, the higher the share of NFTP income. The study in northern Benin (Heubach 2011) demonstrated that the amount of NTFPs extracted and the cash income through local sales increases with income status, mainly due to better access to farmland. Poorer households face higher opportunity costs in terms of extraction (distance to extraction sites and competition for the resources). However, as a result of population growth, expansion of agricultural land, and increased restricted access to woodland, demand for NFTP will increase as well. Moreover, a number of studies find that while NFTP extraction helps to prevent further poverty and sustains current livelihoods, respectively, it might not help to lift people out of poverty (Angelsen and Wunder, 2003²²; Belcher, 2003²³; Dewi et al., 2005²⁴). Therefore, lowering the opportunity costs of conserving woodlands might be achieved by creating stable income opportunities independent of NFTP extraction or by

¹⁶ 2009. Kamanga, P., Vedeld, P., Sjaastad, E. Forest incomes and rural livelihoods in Chiradzulu District, Malawi. *Ecology Economics* 68, 613–624.

¹⁷ 2004. de Merode, E., Homewood, K., Cowlishaw, G. The value of bushmeat and other wild foods to rural households living in extreme poverty in Democratic Republic of Congo. *Biological Conservation* 118, 573–581.

¹⁸ 2009. Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J., Mathijs, E. The economic contribution of forest resource use to rural livelihoods in Tigray, Northern Ethiopia. *Forest Policy and Economics* 11, 109–117.

¹⁹ Bonou, Alice. (2013). Valeur économique des Produits Forestiers Non Ligneux (PFNL) au Bénin. 10.13140/2.1.4470.2406

²⁰ NFTP considered for the analysis in this study is Shea almonds (*Vitellaria paradoxa*), the seeds of Néré, the pulp of Néré (*Parkia biglobosa*) and the leaves of Baobab (*Adansonia digitata*). It is assumed that firewood is collected for own consumption only, and main source of the household income is agricultural production (cotton)

²¹ 2011. Katja Heubach a, □, Rüdiger Wittig a,b, Ernst-August Nuppenau c, Karen Hahn. The economic importance of non-timber forest products (NTFPs) for livelihood maintenance of rural west African communities: A case study from northern Benin. *Ecological Economics* 70 (2011) 1991–2001

²² 2003. Angelsen, A., Wunder, S. *Exploring the Forest — Poverty Link: Key Concepts, Issues and Research Implications*. CIFOR, Bogor, Indonesia. pp. viii, 58p.

²³ 2003. Belcher, B.M. What isn't an NTFP? *International Forestry Review* 5, 161–162.

²⁴ 2005. Dewi, S., Belcher, B., Puntodewo, A. Village economic opportunity, forest dependence, and rural livelihoods in East Kalimantan, Indonesia. *World Development* 33, 1419–1434.



increasing the efficiency of crop production systems, thus also increasing the resilience of affected rural populations. These measures will improve rural livelihoods and contribute to forests and biodiversity conservation.

34. Considerable potential for NFTP development exists in Benin. NFTP demand is growing but value chains are poorly organized or non-existent. NFTP trade is informal, underappreciated, and not fully captured in statistics, and often characterized by lack of knowledge among actors about value chain, and lack of knowledge about processing techniques. Market information systems are often absent or inefficient, and results in low value added due to lack of chain vision and low technology. At the same time, organized NFTP trade have positive impacts on forest based, rural and urban livelihoods and might play a big role in food security, health and income to meet basic needs.

35. The NFTP sub-component aims at increasing the NFTP’s contribution to the national economy and improving local communities’ livelihoods. The component will focus on the development of honey value chain in selected GFs and plantations.

36. The project is aiming to promote the development of an acacia honey value chain from the 15,000 hectares acacia plantations to be established by the project, for the benefit of forest-dependent communities. The project will finance the acquisition of hives and capacity building of selected forest-dependent communities to make honey in Acacia plantations and train them in the best honey making practices; a marketing study looking at sources of demand, packaging, labeling and certification options and provide recommendations to implement the best options which the project will finance to support forest-dependent communities; and small honey processing units for beneficiaries organized in cooperatives with support from the project.

37. Data for the assessment of honey production were derived from the evaluation report of IGAs²⁵ for the Additional Financing for Forests and Adjacent Land Management project P132431, Directorate General of Water and Forests and Hunting data and assessment made by the Benin Forestry study²⁶ and various research studies in the region. On average, it is possible to manage 10-15 hives per one hectare of managed acacia plantation, with the yield of about 15 kg of honey per year from one hive. With the average price for honey US\$5 per kg, annual revenue is US\$75/hive, or with the modest estimate of 10 hives per ha of acacia – US\$750, or US\$11.25 mln from 15,000 ha of acacia plantation.

38. Assumptions for the analysis were made based on the interviews in Parakou, the Forestry study²⁷, and country case studies in the region:

39. gradual increase of the honey production capacity, to 10 hives per ha of acacia plantation during project implementation, assuming the average price as FCFA 2,000-3,000 (average as US\$5) per kg of honey. It is also assumed that honey production will be reduced after wood is harvested every six years assumption is based on the subsidy/grant mechanism.

40. Results of the analysis demonstrate a positive NPV, assuming a developed value chain for honey.

Table 6. Assessment of the NFTP benefits - apiculture

Discount rate, percentage	5	10	20
NPV, US\$M	44.7	7	9.9
IRR, percentage	92%	83%	68%
B/C ratio	46.1	31.8	17.1

41. Sensitivity Analysis: The sensitivity analysis conducted based on the analysis of scenarios allowed for simulating financial

²⁵ 2018. Juan López Villar. Rapport d’évaluation de l’impacte des agrs de premiere generation (PGFTR-FA).

²⁶ 2018. Benin. Evaluation Des Forets Classees. Banque Mondial: Washington DC. On the average basis of 100 hives per GF each producing 20 liters per year, totaling 40,000 liters at an average price of Fcfa 2,000. Highest income received by the IGA participant in apiculture reached FCFA 110,000 during 6 months in average

²⁷ 2018. Benin. Evaluation Des Forets Classees. Banque Mondial: Washington DC.



performance indicators (NPV, IRR and C/B Ratio) based on the most sensitive endogenous variables of the analysis model used, namely prices and production output. The simulations show that financial performance falls, albeit much more slowly, as the prices of products fall.

Results

42. Results of the economic analysis show positive outcomes for the project. A summary of economic simulations is summarized in Table 6 below. The table shows the NPV, benefic cost ratio and IRR (selected interventions) for various discount rates, carbon prices scenario and variations of benefits, including for simulations without carbon benefits.

Table 7: Summary of economic analysis

	All Benefits with low carbon price			All Benefits with high carbon price			Benefits except carbon and soil benefits			50% Benefits and low carbon benefits		
	5	10	20	5	10	20	5	10	20	5	10	20
Discount rate, percentage												
NPV, US\$M	707	424.8	191.2	1,084.70	674.8	327.5	126.9	57.1	7.8	518	316.9	148.6
B/C ratio	14.6	10.6	6.7	22.2	16.6	11.1	3.3	2.1	1	11.1	8.3	5.6
IRR, percentage							18	13	4			

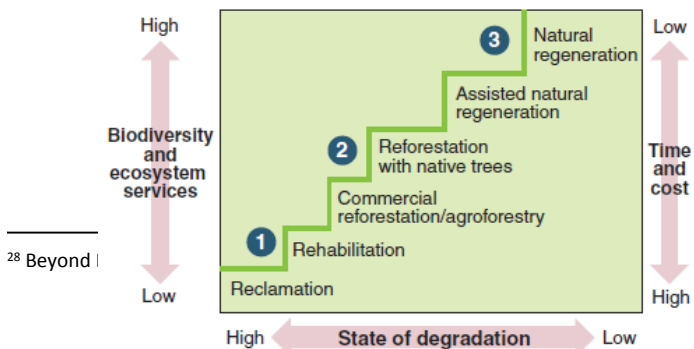
43. This analysis was limited to the benefits and values that can be attributed to the project and can be measured at the time of assessment. Sensitivity analysis demonstrate strong economic results, even when tangible benefits are accounted for, under various discount rates.

Discussion

Timber and fuelwood

44. Timber and wood fuel plantations, if managed sustainably, could potentially play a positive role in landscape restoration, although these new forests will not match the original old-growth forests in specie composition. Forest restoration could contribute to restoration of various ecosystem functions in degraded landscapes and could contribute to recovery of many components of the original biodiversity. The graph below²⁸ demonstrate various approaches in restoration and desired outcomes. The proposed project combines various elements thus maximizing the impact for income generation and landscape restoration.

Figure 1 Restoration staircase





45. Public financing is justified in this case for various reasons: timber plantations will increase forest cover and result in long-term income generation for the local population in the form of wages for those engaged in the plantation works and benefiting from the plantation operational cycle by consuming younger trees for wood fuel, and at the mid-cycle – as consumers of lower cost low diameter trees.

Fuelwood plantation management approaches and economic analysis

46. Choice of the management approach for fuelwood plantation will affect the economic results of the project. A World Bank Energy Sector Management Assistance Program (ESMAP) study²⁹ analyzed two main approaches to the management of the fuelwood plantation: community-based forestry management (CBFM) or private operators.

47. The study found that CBFM is costly, needs active long-term financing instruments in place to ensure sustainable implementation; in many locations neither producers nor community forest funds can currently support these programs over the long run (resulting from low prices for forest products and NFTP, inconsistent selection of fees and other payments by users groups). Rolling out of the CBFM is often an issue, due to changes in the forestry agency management, and lack of adequate capacity development support for new supervisory and advisory roles. As a result, harvesting systems in the CBFM are not sustainable, and require additional funding and technical assistance.

48. At the same time, evaluation of the projects in Niger and Senegal demonstrated positive results in achieving overall objectives in forestry management: considerable annual increase in the forest stock was reported after local communities took over the management of their forest resources. CBWP was instrumental in promoting forest rehabilitation and reducing deforestation rates. Moreover, decentralization of forest management indirectly benefited enhanced governance, civil society development, and conflict resolution in the areas where it was implemented.

49. Under the private sector model (Forest Replacement Associations, FRA) small, medium-sized, and other wood-consuming businesses that are legally responsible for the sustainability of their wood consumption unite among themselves to create a reforestation program. Lessons learned from the FRA model implementation included the following: i) farmers see multiple benefits in participating in FRAs, especially the incentives (technical assistance, free high-quality seedlings) that play a key role in their satisfaction and the success of their small forest plantations; ii) business consumers of wood benefit from a legal and guaranteed supply of quality wood; iii) FRAs can be an effective partner and intermediary between government and private sector in mitigating the impact of wood consumption on natural forests; and iv) FRAs requires minimal support for the business.

Transhumance

50. In the Sahel and West Africa, transhumant pastoralism is one of the major livestock production systems, with an estimated 70-90 percent of cattle and 30-40 percent of small ruminants³⁰. There is agreement among experts that this method preserves the environment and is viable, competitive and a provider of seasonal work³¹.

51. Trade routes in West Africa for the export of live cattle and small ruminants lie from Sahel to coastal countries. Animals leave from Mali and Burkina Faso to supply Côte d'Ivoire, Ghana, Togo and Benin ('central corridor'), from Chad, Niger, Sudan, Central African Republic, Mali and Burkina Faso to supply Cameroon, Nigeria, Benin and Togo, and from Mauritania and Mali to Cote d'Ivoire, Senegal, Gambia and Guinea Bissau ('western route').

²⁹ 2010. Rogério C. de Miranda, Steve Sepp, Eliane Ceccon, Stefan Mann, Bipulendu Singh. Sustainable Production of Commercial Woodfuel: Lessons and Guidance from Two Strategies. ESMAP. World Bank.

³⁰ 2015. Bouslikhane, M. Cross Border Movements of Animals and Animal Products and Their Relevance to The Epidemiology of Animal Diseases in Africa. OIE Regional Commission

³¹ OECD, ECOWAS



52. According to information received from United Nations High Commissioner for Refugees (UNHCR) regional office based in Dakar (August 2018): it is estimated that 62,000 persons were internally displaced in Nigeria in 2017 as a result of farmer-herder conflicts, and 3000 persons in the northern part of Benin (country) in June/July 2018 for the same reasons.³²

53. The direct economic value considers measurable and quantifiable production, (live animals, meat, milk, hides and skins). The economic weight of animal-drawn transport and jobs in the livestock sector should also be included in this. For example, pastoralism's contribution to the agricultural sector ranges from 24 percent in Burkina Faso to 84 percent in Niger. Finally, in terms of employment, pastoralism is a source of income for 80 million people in West Africa (SIPSA- Information System on Pastoralism in Sahel)); it is in fact a major source of revenue for local governments³³.

54. The indirect economic values should be assessed, such as benefits of grazing for soil regeneration, management of biodiversity or carbon storage, artisanal products and gathered substances (gum arabic, honey, medicinal substances, bicarbonate); the social capital represented by the herdsman's technical and organizational knowhow; cultural wealth and social bonds; and livestock-based savings³⁴.

³² 2018. Pastoralism and Security in West Africa and the Sahel: Towards Peaceful Coexistence. UNOWAS.

³³ 2016. De Haan, Cornelis. Prospects for livestock-based livelihoods in Africa's drylands (English). A World Bank study. Washington, D.C.: World Bank Group.

³⁴ 2013. World Bank. High-Level Forum on Pastoralism in The Sahel Nouakchott (Mauritania), 29 October 2013