



CEREEC/ECREE

# Forest Resources Assessment in ECOWAS

Regional report

Colonel Alassane NGOM,  
International Consultant

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## **ACRONYMS & ABBREVIATIONS**

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**UNFCCC:** United Nations Framework Convention on Climate Change

**ECOWAS:** Economic Community of West African States

**CFDC:** Community Forestry Development Committees

**CILSS:** Permanent Interstate Committee for the Fight against Drought in the Sahel

**CPO:** Conference of Parties at the Convention

**CREEC:** Centre for Renewable Energy and Energy Efficiency of ECOWAS

**FAO:** Food and Agriculture Organization of the United Nations

**GEF:** Global Environment Fund

**FRA:** Forest Resources Assessment

**GCCA:** Global Climate Change Alliance

**CSO:** Civil Society Organizations

**MDG:** Millennium Development Goal

**UNEP:** United Nations Environment Program

**UNDP:** United Nations Development Program

**PREDAS:** Promotion of Household and Alternative Energies in the Sahel

**ProDRA:** Rural Development Program with Agriculture included

**PROGEDE2:** Traditional Energy Management Project and Substitution

**REED +:** Reducing emissions from deforestation and forest degradation

**SGP:** Small Grant Program

**LULUCF:** Land Use, Assignment Change of Land and Forestry

**UNCEFS:** National Union of Forest Farmers Cooperatives of Senegal

**SIEF:** Ecological Information System Forest and Pastoral

**DBMS:** Database Management System

**NSDS:** National Sustainable Development Strategy

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## **EXECUTIVE SUMMARY:**

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This summary describes the context of the implementation of the study, the main results obtained by thematic component: (i) forest governance (ii) forest taxation (iii) the current state of regional forest resources (iv) resources of biomass energy. Thus for each component it synthesizes the state of play in the ECOWAS space and then generates recommendations.

### **Reminder of the context and justification of the study:**

The Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE) is a specialized agency of the Economic Community of West African States (ECOWAS). The overall objective of ECREEE is to contribute to economic, social and environmental development of West Africa by improving access to modern, reliable and affordable energy services, energy security and reduction of greenhouse gas emissions related to energy and climate change impacts. The specific ECREEE goal is to create conditions for a favorable framework and an enabling environment for the emergence of renewable energy markets and to promote energy efficiency by supporting activities to mitigate existing barriers.

In the ECOWAS region, the extent of forest resources is estimated at 73.23 million hectares, or 15% of the total area of the 15 ECOWAS States (FAO, FRA 2010). These forest resources are undoubtedly the main source of supply of wood energy, service wood, and timber and export wood from a population estimated at almost 234 million inhabitants. They also provide these populations with Non Timber Forest Products (NTFP) that contribute to the various food safety improvement, health, and household income.

At the specific energy level, approximately 80% of the population of this area still uses traditional biomass for cooking, often unsustainably with inefficient stoves. Thus, expenses for cooking fuels continue to rise and supply chains, non-sustainable, of fuel wood lead to environmental degradation and deforestation, especially in areas close to urban centers. This alarming deterioration state of forests and their resources makes this precarious energy dependence and is a threat to the whole sub-region if no action is taken to reverse the trend.

However, we must recognize that no stakeholder in the areas of supply and demand of fuel wood sector has the ability to transform this sector by itself. A concerted and coordinated

regional approach between all key ECOWAS stakeholders is necessary to foster a robust and sustainable supply of firewood.

It is in this dynamic that the Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE) evolves, which is a specialized agency of the Economic Community of West African States (ECOWAS) whose main objective is to contribute to economic, social and environmental development of West Africa by improving access to modern, reliable and affordable energy services and energy security and reduction of greenhouse gas emissions related energy and climate change impacts.

However, to achieve this objective, it is essential to have timely and reliable data to build effective policies and strategies. It is in this context that the present study is conducted to make a comprehensive assessment of information on the state of the forest and related resources in the ECOWAS region in the light of REDD + strategies and opportunities and WACCA but also to provide data up to date on the energy resources of biomass and clean energy sources, safe, effective and affordable, and their use.

It is in this context that the present study was sponsored by the ECREEE for a comprehensive assessment of forests and related resources in the ECOWAS region by providing data / date information on biomass energy resources for both the supply and demand.

## **Analysis by thematic component:**

### **Forest Governance: The situation today:**

The strategic axes of orientation of the management of forest resources at the ECOWAS region are defined in several documents adopted by this institution, the most critical are: the convergence plan for forest management (adopted by the Conference of Ministers of ECOWAS forest area in September 2013), the common environmental policy (2008), the common agricultural policy (2008), the Policy on Energy Efficiency (2012), the Policy on Renewable Energy (2012) etc. These policies generally aim to satisfy the needs of people with sustainable management of natural resources and protection of the environment. Countries in the region primarily dependent on forest resources for energy cooking, the major focus remains the satisfaction of energy needs without depleting resources with promotion of renewable energies in energy balances and access to energy for all.

Land tenure has great influence on the sustainable management of forest resources. The countries of West and Central Africa have given themselves as a major focus, since the Yaoundé International Conference in 2009 on Tenure, Governance and Forest Enterprises to initiate or accelerate the statutory tenure reforms to "legally recognize community ownership of forests and to double the area of land belonging to communities" by 2015.

Many countries have also developed institutional arrangements to recognize and secure community rights. Globally all countries of ECOWAS have a strategy to decentralize the management of forest resources and the level of deepening the powers granted to local authorities, we can distinguish three groups. In arrangements in place for the decentralized management of forests States, decentralized local authorities and local communities, the private sector (loggers), civil society and NGOs all play regarding the roles and key responsibilities.

This change was accompanied by a reform of forestry laws that followed the following motion: (i) a centralist vision during the colonial era with the ranking of largest area of forests to meet the needs of the colonizer, (ii) conservation and punishment to preserve spaces despite the pressure of the people after independence, (iii) a right of gratitude to people with participation of the people and community forestry from 1980. From 1990, plans forest activities are developed in several countries with the support of development partners (FAO). The major current concerns that influence current reforms of forest codes are rather related to sustainable forest management.

Access to the forest and forest resources remains limited in the forests under the management of the state and highly regulated in the soils of forests. Private forests, even if they are provided in most forest laws of the countries of ECOWAS, the modalities of ownership are sometimes very complex and poorly understood.

Outside the timber, service and wood energy, which play an important role in the economies of the region, the forest offers many products and services that have a significant weight in people's lives (food, traditional medicine, hunting, recreation and cultural services etc.). Given their non-market character or consumption, these products and services are largely unrecognized in both the growth and the formation of capital in the region countries.

The exploitation of these forest products and services is made on the basis of legislation whose enacted standards are not always met. This poses a problem of good governance and sustainable management of forest resources and calls for: (i) the definition and systematization of good forest management practices, harmonization of policies and legislation for greater cooperation in ECOWAS space.

### **Recommendations:**

Harmonization of forest governance at the regional level is a huge project that deserves that countries spend the necessary energy to do so. Key recommendations to achieve this can be summarized:

1. Work to move towards a common forestry policy with a focus on:
  - a. Orientations per eco geographical area;
  - b. Strengthen cooperation between countries taking into account the comparative advantages of the country.
2. Align forest laws and an effective forest taxation and favorable to the promotion of sustainable management of trans boundary forest resources (fight against cross-border fraudulent exploitation);
3. Capitalize gains in the policy of decentralization of forest resource management with exchanges and sharing of best practices;
4. Promote a regional program of sustainable forest management.

### Forest Taxation: The situation today:

In almost all ECOWAS countries, forest taxation was an important instrument to generate revenue for the benefit of the States. It played in a lesser extent as a lever to influence the behavior of actors in order to produce sustainable management because of their rigidity, their often suboptimal level of their sometimes ineffective recovery. Countries have undertaken tax reforms to encourage local processing of harvested timber and better redistribute forest income between the States, the decentralized local authorities and populations.

To further this reform and allow forest taxation is an element of effective forest policy, there's place for:

- Review levels of royalties up to the value of products,
- Improve administration of taxes and fees to increase their efficiency,
- More out of market mechanisms to increase transparency and vitality in the evolution of the royalties,
- Formalize the decentralization of forestry taxation.

The effectiveness of taxation to promote must play an important role in improving the state of the forest resource in the States.

### Recommendations:

To improve forest taxation and adapt it in the context of the ongoing decentralization in all ECOWAS countries, it is important to:

1. Objective adjustment of the level of taxes and royalties of the Forest Products operated according to the actual market value of the exploited products or regeneration cost; the introduction of market mechanisms (competition) for access to the resource;
2. Define distribution rules and procedures and management of forest revenue between the State, decentralized local authorities and local people;
3. Define areas for harmonization of fiscal policies in the region to promote cooperation between the countries and to avoid distortion especially between neighboring countries.

### Current status of regional forest resources: The situation today:

Forests in the ECOWAS (74.3 million ha) are in a very degraded state due to many natural and anthropogenic factors. Indeed, the annual deforestation levels during 2000-2005 were estimated at about 899,000 ha of forest, which is a current rate of loss of 1.2% (FAO, FRA 2005).

Furthermore, the methods for evaluating these resources vary from one country to another and sometimes even within the same country. Thus the forest data available are often not very accurate especially about the estimation of forest area but also stand dynamics, essential elements in the forest management planning. This disparity is remarkable both in terms of resource mapping methods from the point of view of the evaluation of potential forest.

At regional level, two types of classification are mainly identified a classification inspired by that of Yangambi (1956) and classification Global Land Cover Network (GLCN) used by FAO. Note that this is the Yangambi classification that is most commonly used in the sub region. It strongly influenced the preparation of vegetation maps in the Francophone countries of West Africa and was an inspiration for many nomenclatures currently used in these countries. Given the difference in classification, it is difficult to overlay and compare the cards from these two methods. Also regarding the evaluation of potential, few countries have a national inventory and disparity of methods makes it difficult consolidation of inventory data at regional level.

On the forest exploitation plan, we see in almost all countries of the space a lack of organization of the different production sectors (timber, fuel wood, non-timber forest products, etc.) resulting in non-professional actors (except for timber). However, significant efforts were noted to make sure more sustainable management of forest formations in the sub-region with improved logging, improving the knowledge of the potential, better use of geometrics for forest management, the development of management plans and forest management and the definition of operating standards, improved monitoring of the implementation of management plans, improving participation populations, etc.

While it is important to harmonize approaches and policies, as was raised in the previous chapter, but it is also essential to check and improve techniques and methods of intervention to better control potential but also the dynamics of forest stands. This will allow better planning of forest management through participatory and integrated management.

### **Recommendations:**

To deal with forest degradation, vital part in the economy of the various countries of ECOWAS, states must:

1. Strengthen the policy of decentralization of forest management is underway in most countries of space;
2. Promoting participatory and integrated management of forest stands for sustainable management of forest resources in the sub-region;
3. To harmonize the technical methods and mapping and forest resources assessment (mapping, forest inventory);
4. Arrange the forest products industries through a professionalization of actors;
5. Promote private plantations through an incentive for economic operators to invest in the sector with attractive conditions.

### **The biomass energy resources: The situation today:**

The energy profile of the countries in the field of cooking energy is quite similar. They all depend on forest resources to meet their cooking energy needs. Indeed biomass is between 50 and 90% of the final energy consumption.

Analysis Offer / demand wood energy shows that the supply of the country is not sustainable because there is a gradual degradation of resources. The analysis of intra-country supply shows that in the ECOWAS region, despite the existence of deficient regions fuel wood within countries, supply is ensured by a transport region between wood energy. ECOWAS region is still self-sufficient in energy wood and exchanges between countries of fuel wood are almost nonexistent except in Gambia, where there was a massive importation of timber, heating and charcoal from Senegal.

The wood energy demand is growing and is maintained by: (i) the population believes, (ii) the rate of urbanization (iii) cooking practices subservient wood energy, (iv) accessibility (availability, price, etc.) of wood energy etc.

Aware of the unsustainability of supply of wood energy given the unsustainable exploitation, countries have developed projects and programs to give improved stoves to increase energy efficiency in the sector. The experimental results are often mixed at country level, especially in the introduction of more efficient carbonization wheel. Alongside of alternative energy sources have been promoted without much success in the region such as butane gas, kerosene, biochar, etc.

These experiences have been limited due to various constraints, among which may be noted; Relativity efficiency equipment (again depending on the level of training of actors), the absence or insufficiency of consensus standards, the still high price of equipment and alternative energy sources, the irregularity of supply, etc.

For the success of these projects, it is urgent to put a regional program of clean cooking sector with a clear definition of options about the involvement of the private sector, the role of States, grants management, research development the adaptation of laws and regulations, communication and sensitization of stakeholders.

### Recommendations:

Recommendations may be technical, socio-economic and institutional:

1. At the institutional level:
  - a. The harmonization of policies, strategies and procedures for implementing projects and programs. At this level, it should be guided by the approach of PREDAS in defining strategies but ensuring define regional indicators and countries contribution levels to have a clear consolidation strategy;
  - b. Preparation of legislative and regulatory framework for promotion of efficient cooking devices and alternative cooking energy for the development of regional cooperation exploiting the comparative advantages of countries,
  - c. Study grants carefully as equipment and energy sources to promote, the countries concerned and their respective comparative advantages, define their levels of mobilization procedures, their temporal evolution, roles and responsibilities of the beneficiaries, their compatibility with carbon finance etc.
  - d. Defining an effective strategy for involving the private sector ensuring sustainability
  - e. Setting standards and conditions of their applications etc.

2. At the technical level:
  - a. Improving efficiency efficient cooking equipment with production standard for the certification of returns;
  - b. Define measurement protocol equipment efficiency and energy sources for a comparison between equipment
  - c. Developing research development on cooking equipment and SEA,
  - d. Develop training modules and curricula
  - e. Better document the potential impact of the distribution of ECE SEA and climate to better seize opportunities related to carbon finance,
  
3. At the socioeconomic level:
  - a. Doing market research equipment and SEA countries to levels that can engage the private sector:
  - b. Develop social marketing programs to engage the consumer to create a viable market,
  - c. Document the socio-economic impacts of the promotion of ECE and SEA
  - d. Document the impact of the promotion of ECE and SEA on the health of women and children.

## INTRODUCTION

The 2025 vision of the Heads of State of the ECOWAS sub-region is to "turn the West Africa in an area without borders where citizens will benefit from the opportunities and develop in a sustainable way, the enormous resources of the region ". This West African area is considered "a regional space that allows people to make transactions and to live in peace and dignity in the context of the rule of law and good governance."

In the ECOWAS region, the extent of forest resources is estimated at 73.23 million hectares, or 15% of the total area of the 15 ECOWAS States (FAO, FRA 2010). These forest resources are undoubtedly the main source of supply of wood energy, service wood, and timber and export wood from a population estimated at almost 234 million inhabitants. They also give these populations Non Timber Forest Products (NTFP) that contribute to the various food safety improvement, health, and household income.

On the specific energy level, approximately 80% of the population of this area still uses traditional biomass for cooking, often unsustainably with inefficient stoves. Thus, expenses for cooking fuels continue to rise and supply chains, non-sustainable, in fuel wood lead to environmental degradation and deforestation, especially in areas close to urban centers. This alarming deterioration state of forests and their resources makes this precarious energy dependence and is a threat to the whole sub-region if no action is taken to reverse the trend.

However, we must recognize that no stakeholder in the areas of supply and demand of fuel wood sector has the ability to transform this sector by itself. A concerted and coordinated regional approach between all key ECOWAS stakeholders is necessary to foster a robust and sustainable supply of wood energy.

It is in this dynamic that the Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE) evolves, which is a specialized agency of the Economic Community of West African States (ECOWAS) whose main goal is to contribute to economic, social and environmental development of West Africa by improving access to modern, reliable and affordable energy services and energy security and reduction of greenhouse gas emissions related to energy and climate change impacts.

However, to achieve this goal, it is essential to have timely and reliable data to build effective policies and strategies. It is in this context that the present study is conducted to make a comprehensive assessment of information on the state of the forest and related resources in

the ECOWAS region in light of REDD + and WACCA strategies and opportunities but also to provide data to date on the energy resources of biomass and clean energy sources, safe, effective and affordable, and their use.

After presenting the status of forest governance in the sub regions and forest taxation the report will address the current state of regional forest resources and biomass, to finally finish on REDD + strategies and WACCA initiatives.

Map 1: Map situation of ECOWAS member countries



## CHAPTER I: PRESENTATION OF THE STUDY

### **1.1. Reminder of the context and justification of the study:**

The Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE) is a specialized agency of the Economic Community of West African States (ECOWAS). The overall objective of ECREEE is to contribute to economic, social and environmental development of West Africa by improving access to modern, reliable and affordable energy services and energy security and reduction of greenhouse gas emissions related to energy and climate change impacts. The specific objective of the ECREEE is to create conditions for a favorable framework and an enabling environment for the emergence of renewable energy markets and to promote energy efficiency by supporting activities to mitigate existing barriers.

In the ECOWAS region, about 80% of the population still uses traditional biomass for cooking, often unsustainably with inefficient stoves. Expenses related to cooking fuels continue to rise and supply chains, non-sustainable fuel wood lead to environmental degradation and deforestation, especially in areas close to urban centers.

In this context, there is a general consensus that these cooking energy-related challenges must not continue to prevail in the 21st century and successful initiatives in the region should be replicated and encouraged. However, to ensure a wide distribution of fuels and clean cooking facilities that are safe, effective and affordable it requires overcoming a myriad of technical, economic, social and institutional obstacles.

However, no stakeholder in the areas of supply and demand of fuel wood sector has the ability to transform this sector by itself. A concerted and coordinated regional approach between all key ECOWAS stakeholders is necessary to foster a robust and sustainable supply of firewood.

To address the many challenges that hinder the supply of biomass as cooking energy, REDD + activities in the WACCA initiative will explore all avenues to promote universal access to energy cooking that is more sustainable and effective in the ECOWAS; working on the stoves, sustainable biofuels (such as firewood cut as part of holistic forest management plans, charcoal product with improved techniques, (char) briquettes / pellets agricultural residues or other biomass, biogas and bioethanol) and other modern fuels. The objective is to ensure sustainable production and distribution of wood fuels in the ECOWAS region.

These regional interventions should help develop the framework and space of the sustainable production of firewood, promoting stoves and cleaner fuels in West Africa, and could catalyze

the sector in the sub-region effectively and efficiently. Areas where these regional interventions would be useful are:

- Access to finance (at the level of both supply and demand);
- Regional standards, common procedures for testing and quality control;
- Regional awareness and promotion;
- Sharing information and knowledge at regional level;
- Regulation and management of fuel wood markets in the sub-region;
- Regional projects to address key research gaps; and
- Regional M & E System

It is in this context that the ECREEE sponsored study on the evaluation of the ECOWAS region's forest resources.

**1.2. Mission Objectives:**

**The overall objective** of the mission is to help provide sustainable, efficient and affordable access to biomass as cooking energy to the entire ECOWAS region. And this, in accordance with the objectives of ECOWAS on renewable energy and energy efficiency policies that seek to ensure that the entire population of ECOWAS has access to clean, safe, effective, affordable and sustainable cooking energy by 2030.

**The specific objective** is to conduct a comprehensive assessment of forests and related resources in the ECOWAS region by providing data / up to date information on biomass energy resources for both supply and demand.

**1.3. Methodology used:**

To achieve the mission, the methodology was to observe three phases that are set out schematically in the table below.

Summary of the different steps of the methodology

<b>Preparatory phase</b>	<b>Data collection phase</b>	<b>Analysis, Synthesis &amp; development of reports</b>
<ul style="list-style-type: none"> <li>• Scoping Meeting with sponsors</li> <li>✓ <b>Better understanding of the TOR and the study objectives</b></li> <li>✓ <b>Adjusting the methodology</b></li> <li>✓ <b>Country reports of plans</b></li> </ul>	<ul style="list-style-type: none"> <li>• Document review</li> <li>• Interview with resource persons</li> </ul>	<ul style="list-style-type: none"> <li>• Development of country reports by national consultants</li> <li>• Synthesis of country reports by the international consultant</li> <li>• Analysis and Alignment</li> <li>• Region Development Report</li> <li>• Preparation of the report on REDD +</li> </ul>

<p style="text-align: center;"><b>Fasteners Region</b></p> <ul style="list-style-type: none"> <li>Contractualization with national consultants</li> </ul>		<ul style="list-style-type: none"> <li>Preparation of the report on the WACCA plan of action</li> </ul>
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### **1.3.1. Preparatory phase:**

It started with scoping meetings held in Praia (Cape Verde) on Thursday 29 and Friday, January 30, 2015. This meeting allowed better clarification of the objectives of the study and its issues, and better share the methodology proposed by the consultant. The consultant on the basis of terms of references and study objectives proposed an outline of the regional report and an outline of the country report and the documents were approved at this meeting.

### **1.3.2. Data collection phase:**

Following the scoping meeting, the contracting formalities were completed for each member country for data collection at the country level and the development of the next country report according to the validated canvas. These consultants were selected based on their experience.

Semi-structured interviews were also conducted with resource persons at the ministries of energy, environment and forest resources in different countries. Similarly, detailed interviews were held with resource persons directly responsible for the implementation of the forest policy.

It is also during this phase that a literature search was conducted in the field with the consultation of various documents concerning:

- Regional policies on forestry, agriculture, energy, natural resources and environment of ECOWAS, UEMOA, CILSS, etc.
- Information on the countries concerning the assessment and management of forest resources and the cooking energy;
- The annual work plans and reports of activities of ministries, programs and projects on biomass energy resources in different countries;
- Reports of technical projects and workshops and consultants reports in the field;
- Relevant scientific publications concerning the use of forest resources and energy policies, regulatory frameworks and other country strategy documents.

### **1.3.3. Synthesis and preparation of various reports phase:**

For each country, the national consultant hired for that purpose produced a country report. Then the international consultant was based on these reports, the report of consultants for REDD + and mapping. These reports were synthesized and analyzed, supplemented by the results of the documentary review and interviews with resource people to develop different requested reports.

### **1.3.4. Expected deliverables:**

The consultant should provide a single report covering the areas mentioned in the terms of reference. But during the kick-off meeting and submission of the canvas of the regional report, ECREEE had expressed the wish to see the chapters on REDD + and WACCA action plan addressed in two separate documents. As a result of this meeting, provided deliverables are: a regional report on the evaluation of forestry resources in the ECOWAS region, a report on REDD + in the ECOWAS region and a report on a WACCA action plan.

The consultant was to present provisional documents in a regional workshop with key stakeholders in the Member States for validation.

### **1.3.5. Constraints and limitations of the study:**

The major difficulties encountered during the execution of this study are among others:

- The delay in finalizing the contracts of some national consultants who at the last moment were unavailable;
- The delay in the provision of national reports;
- Failure to inform certain parts of the canvas making the analysis delicate at regional level;
- The lack of recent data especially for the forest resources assessment: only a few countries have not conducted a national inventory;
- Difficulty in comparing data between countries given the disparate formats and collection conditions;
- The use of several nomenclatures by the disparate sources of collection, processing and distribution of information, especially for map data.

## CHAPTER II: FOREST GOVERNANCE

### Introduction:

Forest Governance in the ECOWAS region is complex from many points of view. Indeed, in the ECOWAS countries, the management of the resource is under a superposition of customary rights, positive law often inherited from colonization and inclination of emerging pressure groups (NGOs and civil society, national private operators and foreign, etc.). The States, challenged by the need for development of resources for economic and social development and that of their conservation, have more and more difficulty to arbitrate on the optimal use of the resource, which means that in many countries, laws and regulations governing the access and management of forest resources are not strictly observed and they often remain the clear case of violation of the rules that could constitute interesting case studies to better address the major issue of forest governance namely bridging the gap between legality, legitimacy and practices for the use of resources.

From colonization to the first twenty years of independence, forest resources have instead been centralized management by States in the ECOWAS region. In recent years, with the push of civil society, the democratization wind and the emergence of local elites, to local communities there has been a movement of decentralization of resource management. This movement has experienced levels and different magnitudes depending on the countries.

Democratic processes and decentralization policies applied more and more in Africa are breeding grounds for good forest governance. However, the coexistence of a multitude of rules, procedures and forums under different legitimacies (customary, projects, policies, state) playing more or less an important role in the management of resources, induces confusion and uncertainty about the rights of each other and makes more complex the definition of business rules.

The ability of the States to define in a participatory manner, policies and rules that are both legitimate and legal, to implement them and to arbitrate conflicts between actors (domestic and foreign) is one of the major challenges of sustainable management of natural resources.

## **2.1.Presentation of the institutional framework for forest management:**

During colonization and the twenty years that followed, centralized management at the state level characterized the governance of forest resources in the ECOWAS region. During this period, large areas of forests have been classified for the production, protection or stockpiling of forestland. The exploitation rights are owned by the State and only a right of use is recognized for local people. Forest management was then entrusted to forestry officials to enforce forest laws and implement regulated forest management actions. The concerns of local populations were weakly considered in the definition of political orientations.

Given the increasing degradation of forest resources, the climb of pressure groups for the protection of the environment and natural resources, the emergence of local elites, the States have initiated management decentralization policies involving various institutions, operating in a legal and regulatory environment in constant evolution.

The guidelines established at regional and country level are heavily influenced by the current state of the environment and natural resources as the common environmental policy of the ECOWAS described in 2008 as follows: The general state of the environment and natural resources is characterized by a general trend of degradation and resource depletion that requires restoration. The main challenges in this situation is; i) land degradation; ii) deforestation, landscape degradation and loss of biodiversity through the combined effects of natural factors such as drought and floods, and human factors such as excessive exploitation of trees and forests; iii) rapid changes in the status and quality of water resources; iv) the degradation of the entire landscape due to the lack of appropriate development and weakness in the restoration of the environment. It is true that efforts are made and capacities are being strengthened, but they are not sufficient and it is essential and urgent that the policies and restoration initiatives are effective without delay. That is what the environmental policy of ECOWAS aimed to achieve.

### **2.1.1. The strategic orientation at the sub regional level:**

At the sub regional level, ECOWAS adopted a common agricultural policy of the sub-region. Sustainable forest management is one of the six fields of priority actions of the policy thus defined: Improving the management of (other) natural resources through (i) organized

transhumance and development of livestock paths; (ii) sustainable management of forest resources (iii) sustainable management of fishing resources.

Specifically in 2006, in the context of assistance for the formulation of the common agricultural policy of ECOWAS, FAO has produced an ECOWAS Forest Policy project that defined the interesting directions with:

A global objective: the conservation and sustainable development of plant and animal genetic resources, restoration of degraded forest land for the sustainable benefit of the population of ECOWAS.

The objectives of the proposed Regional forest policy are:

Harnessing the potential of forests to improve food security and reduce poverty through the multifunctional use of the forest:

- Integrate forestry in sustainable economic development of West African countries in particular through the appropriate commercial use of their forests;
- Contribute to the protection of the environment through preserving vital local, regional and global environmental services and values,
- Strengthening forest services (technical assistance, social environmental impact assessment, monitoring and evaluation, extension services) with a revitalized public sector,
- The decentralization of forest management, supporting community initiatives, and strengthen the role of civil society organizations and the private sector;
- Strengthen the institutional structures for overseeing the implementation of policies and legislation,
- Afforestation to restore forests and degraded forest lands.

That document also identified eco zones in the ECOWAS region and specific objectives for eco zones under regional forest policy.

In September 2013, the Minister responsible for forests adopted a convergence plan for forest management. The Convergence Plan designed to strengthen sub regional cooperation in the fields of forestry and wildlife while mobilizing political support, institutional, financial and technical, and will help to address key issues of common interest or character border such as:

- ✓ Harmonization of policies, forest legislation and regulations taking into account the agro-ecological and institutional frameworks of different features;

Participation in efforts against desertification and land degradation through the rehabilitation of fragile and degraded ecosystems (mangroves, wetlands and arid zones), control of bush fires and uncontrolled exploitation of cross-border pastoral resources and / or shared:

- ✓ Facilitating the role of local actors / subnational (regional and local governments, farmer organizations and other stakeholder organizations, technical departments) in the decentralized management of forest and wildlife resources and the improvement of methods of governance - while involving women and youth;
- ✓ Improving essential services provided by the various forest ecosystems, including their contribution to food security and livelihoods of populations, and optimizing the use of the opportunities related to adaptation, mitigation and vulnerability to climate change and how they affect forest ecosystems in the sub region.

### **2.1.2. The Forest Dialogue process in West Africa:**

The regional institutions in the sectors of forestry and fauna, with the support of institutions and international intergovernmental and non-governmental organizations, initiated the process of dialogue on forests in West Africa leading to the development of this convergence plan. The process was a response to the need felt in the sub-region with the lack of cooperation between the countries of West Africa in the field of forest management and wildlife. FAO has provided technical support to the process through a project of its Technical Cooperation Program Support for the preparation of the Convergence Plan for the sustainable management and use of forest ecosystems in West Africa, which was conducted in collaboration with ECOWAS.

To give more weight to the recognition of the need to harmonize and coordinate policies of member countries, ECOWAS adopted in 2008, a common environmental policy in which forest resources are an important if not decisive. The clear view is that the CEP "of a region of peaceful ECOWAS, dignified and prosperous whose various productive natural resources are conserved and managed on a sustainable basis for the development and balance of the sub-region. For this purpose, the production, processing, consumption, trade and mitigation activities are controlled and managed in a healthy environment in terms of flows of raw materials, waste and end processes.

The overall objective of the environmental policy of ECOWAS is to reverse the environmental degradation and depletion of natural resources, improve the quality of living

environment, preserve biodiversity, to ensure a healthy environment and productive; improving the ecosystem and the welfare of the people of the sub region.

To achieve this goal, four strategic areas were defined:

1. Strengthening environmental governance (implementation of a sub regional mechanism) and promotion of capacities for this purpose;
2. Promoting the sustainable management of resources for improving the sub-regional economy in an environmentally friendly manner;
3. Prevention of environmental pollution and nuisance, municipal waste and for the control of trans boundary movements of waste / hazardous products;
4. Promotion of information, education and communication for a healthy environment.

The goal set in the PEC, particularly in the strategic axis 2 relative to the Promotion of sustainable management of resources for improving the sub-regional economy respectful of the environment.

ECOWAS is first and foremost concerned with. The goal here is in search of sub-regional economic integration in which the environment and the economy are closely interrelated: (i) monitor the conservation, management and sustainable development of natural resources in the sub region for the well-being of its population and (ii) to better understand and optimize the contribution of these resources in terms of goods and services in the sub-regional economy.

To achieve these goals were defined two pillars namely:

1. Improving the sustainable management of natural resources based on principles, criteria and indicators defined for this purpose as with the main points:
  - To promote or enhance the ecosystem approach and land utilization plan;
  - Working to achieve a land tenure system that encourages safer commitment and investment in sustainable activities of natural resources management, restoration and renewal;
  - Promote the water resources management (IWRM) and to support the development and implementation of national IWRM action plans in West African countries;
  - Improve knowledge on water bodies and conservation of inland fisheries and fish farming.

2. The promotion of the management, conservation and sustainable development of forests, wildlife and pasture with the main points:

The size of the sub-regional forest and its contribution to the economies of the forest and the importance of trees ecosystems in local economies argue for giving high priority to forests. Management, conservation and development should be promoted. In doing so, we will implement, within our sub-region, the recommendations of the United Nations Forum on Forests (UNFF) and the Commission of Forests and Wildlife of Africa in terms sustainable management of forests and trees outside forests including the promotion of criteria and relevant indicators such as:

- Promote increased forest cover by the classification of new forests and the expansion of reforestation to help achieve the rate of 20-30% of the land;
- Identify continuously and implement priority programs on the management of common resources;
  - To strengthen cooperation and joint activities for the development and preservation of wildlife, hunting management and the use of bush meat, the creation and management of protected areas and protection of track species disappearance,
  - To contribute, in accordance with the common agricultural policy, i) rangeland management and conservation; ii) improved grazing management in forests and the use of trees, shrubs and feed wild animals; iii) support the organization of north-south transhumance of livestock in search of pasture;
- Promote the sustainable integration of the forest sector and its products in the regional economy and assist in the development of sustainable livelihoods for the people, by making use of timber and non-timber trees and forests;
- Encourage and support the development of large forest management and reforestation programs that enhance the contribution of forests to livelihoods of communities;
- The retention of knowledge and the promotion of sustainable use of the natural ecosystem goods and services.

3. The fight against land degradation, drought and desertification:

This is a priority to help cope with ongoing threats of land degradation, drought and desertification in the dry climate sub region, semi-arid and sub-humid. The objectives will be to ensure the effective implementation of joint programs that address the causes and symptoms of land degradation, particularly:

- Good management of forests and non-forest trees in the sub-region;
- The control of the silting of all kinds, including sand dune stabilization and protection against sand encroachment rich areas;
- Management of large trans boundary river basins with particular attention to the coast;
- Preparation and implementation of common or joint actions in order to establish the different components of the Green Wall for the Sahara and the Sahel;
- To support the implementation of the CCD, through large scale reforestation programs and integrated local rural development programs;
- Promoting a system of energy production, including rational use of wood and biomass in particular on renewable energy sources (solar, wind, etc.).

#### 4. Sustainable management of coastal, insular and marine ecosystems:

- Ensuring sustainable practice of sea fishing and the protection and monitoring of marine fishery resources and environment shared by fighting against looting;
- Develop common approaches and joint programs of conservation and development of the islands and their biological diversity and the protection of the marine environment, the unpreparedness of the coastal population on the possibilities of adapting to new situations caused by climate change;
- Monitoring and implementation of backup system against the consequences of climate change on coastal and marine environments;
- Take measures to prevent, monitor and correct the risk of pollution resulting from intensive exploitation of oil on the West African coast and increased ship traffic carrying oil in the Atlantic;
- Fighting against the silting of low areas and degradation of coastal ecosystems, in particular mangrove forests;
- To fight against coastal erosion which threatens coastal cropland and all coastal development infrastructure.

In the definition of the PEC, ECOWAS has recognized that the analysis of the sub regional situation in terms of institutions and actors involved in the management of natural resources and environmental protection indicates the existence of a wide range and a large number of

stakeholders. Most of them work in isolation and without coordination among themselves and on the basis of the ad hococracy.

The situation is also characterized by the existence of other inter-state institutions that cover a limited number of countries in West Africa, such as UEMOA, CILSS, and the Authority of the Lake Chad Basin.

The activities of these agencies must be coordinated to facilitate the implementation of environmental policy of ECOWAS. From this standpoint, the following aspects must be considered in the future for the implementation of environmental policy of ECOWAS, namely:

- Systematic coordination of the concept and policy frameworks among key organizations in the sub-region in order to ensure consistency in the overall action plan;
- Institutionalize political dialogue between major institutions and organizations of technical cooperation;
- Creation of implementation mechanisms, evaluation and appropriate monitoring;
- Need to set up incentive systems to ensure compliance with policy and standards.

In September 2012, ECOWAS, through ECREEE has developed a Policy on Energy Efficiency of ECOWAS (PEEC). The major strategic thrusts of this policy largely concern the management of forest resources being understood that the cooking energy of countries in the region remains heavily dominated by energy woody end of the exploitation of forest resources.

"The overall objective of regional policy for 2020 is to double the annual improvement in energy efficiency, reaching levels comparable to those of world leaders. This means that every year the amount of energy needed to produce a certain amount of goods and services will decrease by about 4%."

The policy document has a diagnosis showing that cooking is a vital need and that most households in West Africa are the kitchen from wood or charcoal with open fires or stoves inefficient, this being that the systems set up to meet this need:

- Are not secure: women and children exposed to smoke suffer from respiratory diseases. Women can be exposed to danger when they have to collect firewood for cooking;
- Are expensive: many households have much money for fuel for cooking and for food;
- Are not sustainable: in areas where sustainable forest management is lacking, cutting wood for fuel is a factor in land degradation and deforestation;
- Are an obstacle to social and economic progress of women: Women and girls who have to spend many hours collecting firewood, are prevented from engaging in academic or income generating activities.

Based on this diagnosis, one of the specific objectives of the policy is to "achieve universal access to healthy cooking, clean, affordable, efficient and sustainable for the entire population of ECOWAS, 2030".

One of the key actions of the plan developed to achieve the purpose and contribute to achieving the overall objective is to develop safe and affordable cooking, including:

- Improving the efficiency and sustainability of the energy value chain from the cooking of traditional wood and charcoal for the sustainable management of forests, improving the process of converting wood and charcoal, and the manufacture and distribution of high performance homes;
- Develop new channels of cooking biomass energy. This includes pellets, briquettes, biogas and liquid fuels produced from agricultural or forestry waste;
- Promote fuel and LPG stoves and mineral coal. Cooking LPG and mineral coal is very effective;
- Promoting solar ovens, devices relevant in certain areas, for example for schools.

May be noted that energy efficiency is thus an important gateway to consider sustainable forest management, including their planning and definition of sustainability standards to be applied.

Also in September 2012, ECOWAS has developed parallel to the PEEC, a Policy on Renewable Energy (PERC) that wants a relevant response to the serious energy crisis that

ECOWAS countries meet. Indeed they must at once, deal with fuel poverty and meet the challenge of energy security and climate change mitigation. This situation is particularly characterized by;

- A large volume of unmet energy demand (7 to 10TWh between 2006 and 2010);
- Limited access to electricity in general (40% on average and even below 20% in several countries), particularly in rural areas;
- A sustainable supply of wood energy which is no longer enough to meet growing demand and leads to overexploitation of resources or deforestation in some countries.

Taking into account the vast renewable energy potential in the region of the existence of national policy and strategy in renewable energy matters of member countries developed under the coordination of ECREEE, taking into account the efforts of the WAPP to bring out a regional electricity market, and PREDAS (CILSS) on domestic energy, ECOWAS adopted a new regional electricity supply concept based on large production supplied and distributed the Exchange system and the West African power Pool (WAPP) and a substantial contribution of renewable energy financed by the private sector and private banks.

The policy of the ECOWAS Renewable Energy aims to ensure that a growing and significant part of the energy supply and energy services of the Member States is covered by the proper, adequate, reliable, cost-and affordable by renewable energy sources, which will achieve:

- Universal access to electricity in 2030;
- A more secure and sustainable supply of domestic energy for cooking that meets the objectives of the White Paper on access to modern energy services by 2020.

Among these objectives can be retained for the management of forest resources, the one who speaks to reduce the negative environmental externalities of the current energy system, such as overexploitation of forest resources, local pollution and emissions of greenhouse gas by bringing Member States of ECOWAS on the path of sustainable development and a low carbon economy, while developing resilience to climate change. Among the specific policy objectives, one can retain:

- The use of improved stoves 100% by people from 2020;

- The use of effective charring 60% of total production in 2020 and 100% in 2030;
- Use of modern fuels by 36% of the population in 2020 and 41% in 2030.

Several other regional frameworks formulated guidelines more or less directly affect the sustainable management of forest resources it is:

- CILSS through its Regional Program for Promotion of Alternative Domestic energy in the Sahel (PREDAS);
- In 2006, ECOWAS and the West African Economic and Monetary Union (WAEMU) published a White Paper for a regional policy. This instrument has studied the access to energy in the context of the Millennium Development Goals and identified three priority energy targets for 2015: 1) universal access to modern cooking fuels; 2) access to 60% of energy services for productive activities in rural villages; 3) access to two thirds of the population to an individual power supply.

### **2.1.3. Decentralization of management of forest resources:**

The issues of decentralization and natural resource management have gained new momentum in the Conference as the next United Nations Conference on Environment and Development (UNCED) in 1992 and to West Africa, Regional conference on land issues and decentralization held in Praia (Cape Verde) from the Permanent Inter-State Committee to Fight against Drought in the Sahel (CILSS) in June 1994, but the level of the region is the Yaoundé International Conference 2009 on Tenure, Governance and Forest Enterprises which gave more concrete recommendations and more specific indicators for the decentralization of the management of forest resources for the countries of Central and West Africa. At this conference, the countries had decided to initiate or accelerate reforms of statutory tenure to "legally recognize community ownership of forests and to double the area of land belonging to communities" 2015.

Almost all countries have developed or redeveloped instruments to establish new community rights, secure or enhance existing rights. Many countries have also developed institutional arrangements to identify and secure rights such as Community Land Trusts Charters Local, collective land certificates or co-management arrangements of state forests. Significant efforts have been developed for the Sahel-Saharan region (Mali, Niger, Senegal, Benin etc.) to increase the rights of communities in the management of forests and demonstrating that

solutions exist to manage complex situations in tenure the conditions of mobility, transhumance, relocation and immigration. Decentralization has experienced significant changes and has become a catalyst for the local management of land and natural resources. States increasingly adopts gender equity principles, inclusive of management, citizenship and profit sharing. Increasingly large bundles Rights recognize the rights of women, marginalized and vulnerable groups, and those of young people. Promotion of community forestry efforts, such as community conservation initiatives are spreading more and more, and this more than the unconditional recognition of property rights to land and forests. Moreover, we note that such initiatives are often conducted not for the recognition of rights, but rather as a means to offset the harmful effects of centralist forest management practices of States, inherited from colonization with little recognition of customary rights and Therefore, a gradual loss of traditional ways of natural resource conservation. Sometimes, these rearrangements are a means to facilitate the payment of fees, compensation and benefit sharing. Recognition of community rights should be an integral and component prior zoning, planning and land use or forestland only. Undoubtedly, regional instruments that have emerged since 2009 have encouraged countries to become more involved in the tenure reform process. The Initiative on Land Policy in Africa (AWI) and the Guidelines on Land Policy of the African Union (AU) is a solid framework of guidance and support for reforms. In West Africa, however, we note the weakness of the instruments at the regional level in this area.

Globally all countries of ECOWAS have a strategy towards the decentralization of forest management even if the level of implementation varies by country. This policy orientation is also clearly defined in most of the forest policy documents of member states. For example for Togo's vision is formulated as follows: "that by 2035, by strengthening the decentralization process, coupled with an illuminated accountability of grassroots actors, the integration of forestry in rural development, the effective involvement of private actors and civil society in forest management and production systems using an approach that maintains the balance of ecosystems and respects the ecological, social and economic forest ".

In Senegal, it is "Contribute significantly to reducing poverty through the conservation and sustainable management of forestry potential and biodiversity, the maintenance of socio-ecological balance, the consistent implementation the decentralization policy, cooperation in the framework of local and international conventions, and sub regional partnership. "

The ongoing process in most French-speaking African countries are not identical, but they share three essential points: (i) they result from a will often displayed States through a policy of decentralization of public powers in general: (ii) they are focused mainly on the adoption of new laws and regulations with a more or less significant transfer of powers to local authorities; and (iii) they are based on the creation and establishment of decentralized institutions and encourage the emergence of a civil society more involved in the management of natural resources.

"The constitution of Burkina Faso because of the decentralization of the main instruments of development and the promotion of democracy at the local level four laws constitute the legal framework for decentralization Responsibility for the economic, social and cultural development and management. Natural resources entrusted to local government institutions, within their jurisdiction.

In Senegal, the decentralization policy launched in 1972 has enabled local authorities to institute that administers freely and who received in 1996 extended powers for natural resources management and environment. Recently, this policy was reinforced by a universal communalization to create viable territories and capable of carrying a local environmental and social economic development.

In 1982, the Government of Ghana launched the National Development Plan and decentralization, whose basic principles were then incorporated into the Constitution Act, 1992. The Act established two levels of decentralized government: the region and the district. Elected officials at the local level direct the decentralized institutions. The constitution defines the principles of separation of powers between the central government and decentralized institutions. "It is only in countries emerging from difficult situation that the decentralization process is not very advanced (Liberia and Sierra Leone).

Depending on the level of decentralization and competences granted to the territorial divisions can be distinguished:

- A group of countries that have established territorial Communities with forest resource management skills; in the case of Benin, Burkina Faso, Mali and Senegal;

- A group of countries that have established Local Authorities without forest resource management skills with empowering people at the grassroots; in the case of the Republic of Guinea, The Gambia, Niger;
- A group of countries that have not instituted Local authorities or local authorities are still very low (administrative entity, designating authorities without elections, without financial autonomy etc.) with low participation of people in the management of forest resources; in the case of Guinea Bissau, Liberia, Sierra Leone, Nigeria, Ghana, Ivory Coast, Togo, and Cape Verde.

**Countries from Group 1** all have instituted a law that enshrines the territorial authorities and transfer of forest management skills of their area protected. The neighboring villages of managed forests are establishing local forest management structures in relation to the decentralized Communities that can also make contracts for the management and exploitation of forests under their management or even the state.

The laws also open the possibility for the state or the local authorities to entrust the management to third parties (private or villages).

In all countries of this group, the forest must have a management plan approved by the forest service to be exploited. In the implementation of development plans, operation must be declared to the forest service that apply taxes and charges on products operated) for commercial purposes.

*In Mali, the exploitation of the protected area of state resources and domain authorities is subject to the development of a management plan. A local authority can exploit its forest area in board or grant the right to exploit it to third parties. Forested landowners or forest individuals derive any rights arising from their ownership provided that their practices do not constitute hazards.*

*In Côte d'Ivoire, there are two main types of properties:*

*- "The property of the State" exerted on classified forests, national parks and reserves. The state is the sole owner of these spaces, but recognizes their residents use rights that are limited to the collection, agricultural burning and collection of various products,*

*- Partial ownership that applies to the rural land. The state is the owner of ground resources (mines) and wealth brought by the soil (forests), but it does not prohibit the clearing, by the "traditional owners"*

*Forestry Development Committees".*

*Committees have power to negotiate with the operating companies. Communities must receive 30% of forest concessions under license income. In addition operators must repay \$ 1 / m3 directly to the community concerned.*

**Group 2 countries** have a legal framework establishing regional and local authorities but they have no expertise in forest management. For now these are the village communities who manage their forests. Gambia, Republic of Guinea and Guinea-Bissau provide for the possibility of village communities to manage their forests not outsource responsibility to shared or decentralized local authorities. However for Guinea Bissau law remains succinct and participatory management are forests is still timid.

The Gambia has a good experience of participatory forest management which infact is the main orientation of previous (1995 -2006) and current (2010 – 2019) national forest policies. The state, by law, however, remains the sole owner of the Forest Parks (classified forests).

**Group 3 countries** - the countries have **not yet started effective management transfer to local authorities or communities**. Often the codes have not yet been revised.

Remember that some of these countries are among the main exporters of wood ECOWAS zone with forest revenues of several hundred million.

Action is being taken to achieve participatory arrangements, involve people in the management and benefit from some recipes but no law has yet been passed in the sense of a real transfer of management.

#### **2.1.4. Key institutional players:**

##### **2.1.4.1. Roles and responsibilities of the State:**

Practically in all countries of ECOWAS, the State, through the Ministry in charge of environment and forest resources ensures the sovereign functions such as the development and implementation of the forest policy of the country, preparation of legislative and regulatory framework, monitoring compliance with legal provisions, the control of work in the forest and planting the permanent forest estate of the State, the approval of participatory forest management plans, institutional development including the preparation process of transferring / sharing roles to actors, their support and monitoring and advisory support for forestry development. Through the National Directorate of Water and Forests, it also monitors and controls the exploitation of forests for the production and distribution of timber forest products (fuel wood, charcoal, timber etc.) and non-timber including hunting products. The National Parks management is often the responsibility of the Water and Forest Service in many countries, however, for some like Senegal and The Gambia, there are National Park Directorates.

In countries where the potential of the forest capital gives the wood a strategic position in the economic and social development, it has developed a specific organization responsible for the development of the wood. This is the case in Guinea Conakry with the Guinean Office du Bois (OGUIB), Côte d'Ivoire with the Forestry Development Corporation (SODEFOR), Benin with the Office National du Bois (ONAB) and in Togo with the Office of Development and Exploitation of Forest (ODEF).

##### **2.1.4.2. Roles and Responsibilities of Local Authorities:**

Local authorities in the countries of the region, in forest management, roles and responsibilities depend on the level of decentralization of resource management. In some countries or the level of decentralization is quite advanced, the latter acquired more or less important skills for forest management of their land. This is the case of countries such as Benin, Burkina Faso, Mali, Niger, Senegal ... in these countries; the nature of the competence transferred revolves around:

- The protection and monitoring of forests within their territories and non members in the forest heritage of the State;
- Forest management under their land with the designation or not (depending on the country of forest harvest quotas);
- The initiative for the development of management plans for forests in their skills and their implementation;
- The Bread of local development;
- Promoting the development of rural wood-energy markets;
- Supervision and monitoring of compliance with technical requirements of development plans;
- Fundraising for local development.

Note that in the context of decentralization, local authorities often have technical constraints, institutional, financial and human. Indeed, they often have very limited capacity to assume their roles and responsibilities increased by transfers of skills. They often lack the technical skills and quality of human resources. Their budget is often deficient and the state does not always transfer the means commensurate with the competences transferred Communities putting these in a weak institutional position before the state services that are not always ready to unleash the skills they have always exercised.

#### **2.1.4.3.Roles and responsibilities of civil society:**

Many civil society organizations (CSOs) and NGOs involved in rural development through sensitization on environmental protection, energy efficiency and provide support to rural communities for reforestation and the creation of timber plantations energy. They are organized into networks, but their actions on the ground are limited by the sometimes-isolated nature without scale to influence significantly the conduct of the sector actions. Note, however, that more and more, with the development of means of communication, their advocacy is more effective in influencing public policy and contribute to the emergence of environmental awareness and citizen opinion in the equitable sharing of revenues from the exploitation of forest resources and management of externalities it causes.

#### **2.1.4.4.Private Sector Roles and Responsibilities:**

The private sector is a central link in the exploitation of forest resources. It is mostly present at the exploitation, processing, transportation and marketing of forest products in major urban centers. In the countries of the region, the development of sectors of forest products and

services is supported by a diverse private sector. This sector is sometimes applied in isolation for forest development activities in less formalized frameworks.

Depending on the country and exploited types of products it may be noted:

- Operators of wood:

Depending on the country and the importance of their forestry potential, loggers can be individually or forest companies. The exploitation of timber is often made by timber (sawmills) that pays royalties and taxes to the state forest to exploit the forests. They employ local labor. Operators of wood energy are more informal and individualized. As against Senegal, these operators are grouped at national level in a cooperative union with a politico-religious influence of significant capacity to influence strategic directions.

- Operators of wildlife:

Hunting is a traditional activity by local people to meet the food, pharmacopoeia and cultural. Meanwhile, tourists also practice sport hunting. The hunting operators are often individual and are receptive operators of tourists. In Senegal, they are grouped in an organization benefiting from lessees; buy hunting rights on payment of royalties.

- Operators of non-timber forest products plant:

Non-timber forest products plants are increasingly exploited by groups (often women) and individual in food (fruit juices, vegetables etc.), the pharmacopoeia (traditional healers), etc. these sectors are less studied but their growing importance and strengths of products for a better valuation in organic and fair trade markets deserves special attention.

- Operators of environmental services:

The tourism sector is highly dependent on forest ecosystems and their conservation so that this sector carries enough for the development of countries in the region.

In Nigeria, we note that the government encourage private sector participation in forestry development in general and forest plantations in particular through:

- Greater security of tenure over resources created under private initiations;
- Transparent administrative procedures;
- Improved economic incentives;

- Technical advice and support.

Available data on private sector investment in forestry development are relatively low, but it can be said that experiments in this area are quite low. The exploitation of natural potential with the payment of royalties to the State is the most common situation in the region. However in countries like Nigeria, Ivory Coast, Ghana, there have been timid attempts at private plantation. It must be stressed that these are the industrial crops plantations have taken over the plantations intended for timber production. In recent years it begins to develop ecotourism projects with private fence and enrichment animal species classified forests or reserves with signing between private and state of a protocol for the management of these valued spaces.

## **2.2. Legal framework for the management of forest resources:**

The West African region has undergone significant policy and institutional changes. The new political and institutional developments that affect the forest sector in the sub region concerning the decentralization of the administration giving an ever more important in participatory approaches to natural resource management. In this context, we note the changes in intervention strategies, institutional and legislative frameworks, including with empowering grassroots communities and the readjustment of forestry codes.

### **2.2.1. Forest legislation:**

Forest legislation in the countries of the region followed a normative itinerary inspired by major institutional changes characterized by:

- The colonial period: marked by the 1935 Decree in French West Africa and the concept of "scientific forest management" introduced by the British colonial administration in the 1940s formed the bedrock of the forest law with a ranking vast tracts of forest to secure the needs of the colonial administration (making furniture, wooden locomotive power supply etc.). It was during this period that the large forest areas of current states were constituted by the institution of protected forests and reserves. The resource was then subjected to a binding regulation with recognition of customary rights of local populations;
- The era of independence which saw the continuity in the repression despite the pressures of increasingly large forest resources due to a population explosion, an extension of agricultural and pastoral production systems and a growing freedom of

*In Mali, the exploitation of the protected area of state resources and domain authorities is subject to the development of a management plan. A local authority can exploit its forest area in board or grant the right to exploit it to third parties. Forested landowners or forest individuals derive any rights arising from their ownership provided that their practices do not constitute hazards.*

expression. During this time the welfare state is trying, by the authority, restore degraded environments while trying to maintain the integrity of classified facilities;

- In the early 80s, the classified space is increasingly attacked by victims of the effects of the drought that drastically reduces the productivity of agricultural activities. The intervention of donors is then more pronounced. This is the era of forest planning with the development of forest action plans supported by FAO. It is marked by a clear will to promote community forestry and farm forestry with greater participation of the population and other technical services in the implementation of forestry development programs. Forest codes are then massively reformed to bring innovations related to

the recognition of the property of the people on the plantations they have made.

- The major current concerns which influence current reforms of forest codes are rather related to sustainable forest management with (i) the decentralization of the management of forest resources for the benefit of decentralized authorities and communities, (ii) good governance forest resources (the transparency of access to resources, equitable distribution of forest revenues between -State actors local authorities, grassroots community etc.), (iii) the involvement of the private sector in the management of resources forestry, (iv) the inclusion of urban forestry, (v) the inclusion of the fight against the negative effects of climate change etc.

We can see a real will of the majority of states to adapt to the new forest code decentralization policies. Nevertheless, we note the special features, including countries with recent forest codes: it is of Togo (2008), Liberia (2006), Niger (2004) and Côte d'Ivoire (2014). In the region, countries whose codes dates from the 1990s are the majority and the code of some countries like Senegal are currently under revision and The Gambia has completed the

revision process and has a Forest Bill since 2010 which is awaiting adoption by its National Assembly.

Overall, forest codes instituted mainly three major forest areas: forest domain of the state (classified forests and reserves), the protected forest area under the management of Local Government in the advanced countries in decentralization, the private forest estate consists of planted forests.

Outside the forest codes, several other regulations and legislation deal with part of the forest management or their application has a more or less direct impact in the management of forests (environmental code, laws governing forest plantations especially in countries such as Côte d'Ivoire and Ghana, the code of the Hunting and wildlife management, land law etc.)

### **2.2.2. Access to forests and forest resources:**

The terms of access to forest resources in the countries of the ECOWAS region depend mainly on country, status of forest formations, types of exploitation or use of resources, etc. It should be recalled that in ECOWAS space, the main landowner remains the States. Following variables presented above, the terms of access to forest resources can be summarized as follows:

- In forest reserves and national parks: private domain of the state, those forest formations are subjected to a regime more or less restrictive of resource exploitation and even the exercise of individual rights of use or communities. If in the forest reserves the right to use is permitted, the restriction may be total in national parks and reserves (prohibition to graze livestock). The classified area is free from any right of use on the forest floor and limits those on forest products. The protective regime (Mekouar, 1997) in the listed domain may be justified even in the context of decentralization against the requirements of safeguarding the integrity of the area for future generations and the preservation of biodiversity; For a long time, these spaces have made almost natural sanctuaries that have begun to be violated because of population pressures, declining productivity of agricultural and pastoral production systems, increased urbanization in countries, industrial development, including the extractive industry. Indeed, in almost all countries in the region, the area is classified assaulted by agricultural clearing in rural areas with the gradual establishment of villages; Urban perished classified field is coveted by private developers who sometimes manage to benefit from decommissioning or occupancy permit to transform

these housing estates in forests or to install industries; mining basements is also a significant cause of forest reserves and national parks; in recent years, an investor pressure was noted and foreign economic operators from countries like China to develop the oilseed and biofuel in these areas which are often the last forest reserves of our countries; Despite these multiple aggressions, countries have not fundamentally changed the status of these forests; they are often content to leave these illegal occupations.

For example in Côte d'Ivoire, SODEFOR still remains to face the thorny problem of peasant infiltration classified forests for the production of agricultural crops. Agricultural plantation areas conducted in classified forests amounted to 630 119 ha in 1999.

**Table 1:** Agricultural occupations by classified forests

PERIOD	SURFACE AREA (in HA)		POPULATIONS BY CLASSIFIED FOREST (in number)			
	Classified forests	Culture	Aborigina ls	Allocto nes	Foreign	Total
1991-1996	2 198 712	593 477	14 487	27 273	27 064	68 706
1996-1999	2 444 423	630 119	18 699	30 503	29 416	80 404

*Source: SODEFOR / DT, quoted by Albert Albala, 2008, presentation of the forest of Ivory Coast sector*

Concerns remain, as all the strategies implemented to address the peasant question did not give the expected results. The situation in 2020 will be unsustainable if the peasant question in classified forests is not definitively settled. Natural forest area will decrease and development efforts will be futile. If the trend does not change, Côte d'Ivoire will have lost all its forest assets by 2040 (see Study on taxation and incidental taxation forestry, May 2013)

- Protected forests are all the other forest the forest estate has not been the object classification. The protected area of forestland still belongs to the state in the countries of the region. The right of exploitation of resources also belongs to the state in most cases one can establish operating license. However, with the wave of

decentralization that has been observed in recent years, there is in some countries, the decentralized authorities prior authorizations to establish any cut in the forests under their jurisdiction (Mali, Benin, Burkina Faso etc.). Despite this progress in the transfer of management skills, the state remains strong in controlling the designation and assignment of the cuts to third parties. The customary law of the communities in these forests is legitimately recognized, so that even in countries where the transfer of skills to the decentralized Communities is not yet formalized, loggers before cutting wood often seek the agreement of customary chiefs. Use rights are highly recognized and exercised by the people and it is these forests that are the first populations reserves for the extension of crop fields and grazing animals. Note that these clearings are controlled by forest services in countries of the region and give rise to litigation all the more important that land tenure is tightened.

- Private forests are natural formations located on private land owned by individuals or legal entities holding land titles granted by the State (land title or leasehold) and forests planted by private individuals. The reform of forest codes of countries recognized the property rights of the owners of these spaces. However, in most countries the floor still belongs formally to the State even if the practices are sometimes opposites (land sales).

### **2.2.3. Forest use:**

Forests play diverse and important roles for African societies. A 2001 survey in Senegal showed that coastal villages of degraded forest being restored using 77 different tree species for multiple use (PSACD, 2001). Placing the forestry sector in the national economies of the ECOWAS countries is certainly difficult to assess, but everything suggests that it is undervalued for at least two reasons: (i) market forest goods and services are mostly in the informal sector and the added value of their operations are poorly recorded; (ii) self-consumed non-market forest products and services (food, pharmacopoeia, recreational and cultural services etc.) almost entirely escape the national accounts departments. In addition to this, the functions of conservation and restoration of productive bases of our agricultural and pastoral production systems (which are the backbone of the economies of countries in the region) that natural capital plays are not valued in the capital our fixed States.

The timber is the forest product sector that is better monitored in the context of trade. It is intended for domestic processing or export as in Ghana or Nigeria. It is primarily sought for in

construction and woodworking. In 2006, the share of forestry in the GDP was estimated at 0.9% for Senegal and 17.7% for Liberia. That same year, the countries of the ECOWAS region produced 16,713 million meters of industrial round wood and 3124 cubic million meters sawn timber cube. The most forestry sectors contributing to GDP are those of Nigeria (forest sector value in the calculation of GDP: US \$ 1,819 million), Côte d'Ivoire (US \$ 801 million) and Ghana (US \$ 754 million). (FAO, ADB, EC 2003).

The share of the forestry sector in the Gross Domestic Product (GDP) of countries in the region is still undervalued and indicative. A study in Togo in 1997 was proposed to evaluate the contribution of the forest in GDP by differentiating volume actually controlled products, the estimated volume of uncontrolled commercial products and finally the self-consumed products. Based on this analysis the only consideration controlled products is only 2%, while the integration of the two other components allows, according to the author, to achieve a contribution of around 22%.

In Senegal, on the basis of a project conducted of many studies for the internalization of the value of so-called wild resources (fauna and hunting) in the national accounts has developed a satellite account to assess the contribution of these resources to GDP. This was a pretext to develop and validate methodologies for economic valuation of forest resources, necessary to better understand their contribution in the economy of countries in the region.

The procurement functions of forest formations are most prominent because of the essential role they play in the daily lives and local economies. Apart from timber production for the satisfaction of the timber requirements, service and wood-energy that are best-quantified products, forests play an important role in the diet, the pharmacopoeia.

**Food:** The gathering of forest products (fruits, leaves) plays an important role in improving the nutritional status of rural populations' particularly nutritional balance of children. They are an important source of nutrients (sugars, calcium, phosphorus, iron, vitamins, etc.). In many families, they help supplement protein deficiencies due to insufficient intake of animal protein. These products fall into the preparation of most dishes eaten daily in rural areas. Their consumption is therefore part of the culinary traditions of African countries. During lean periods (winter) and famine as is frequently the case in the Sahel (falls in agricultural production), forest products are most often the only alternative against hunger. A huge local knowledge is associated with the use of forest products such as food or medicine. People were

able to survive food shortages and famines memorable in 1914, 1919 and 1942 thanks to their knowledge of animal and plant products from the forest.

**Pharmacopoeia:** the forest continues to play an important role in the supply of medicines to the populations of countries in the region. But this forest function is strongly linked to local knowledge developed from ancestors. Unfortunately, this utility is now seriously threatened by the loss of the non-maintained local knowledge. Knowledge of the therapeutic properties of forest species often owned by the elderly was transmitted from generation to generation, including through certain rites and customs more or less disappeared. In addition, the disappearance or scarcity of certain animal species such as plants does not favor the renewal of knowledge. However, since the devaluation of the CFA franc in 1994, there has been increasing recourse to the pharmacopoeia following the decline in purchasing power of the population and the rising cost of pharmaceuticals. This rush pressed increasingly strong on forest resources depending on the parts taken, periods and sampling areas. In recent years, awareness of the potential of forests in this field, some countries have expressed a strong desire to further institutionalize the contribution of traditional medicine to participate in the health development of the people. This notes increasingly, reconciliation between "traditional practitioners" and academics (doctors and pharmacists) to find a harmonious integration capable of achieving synergies. Indeed, research is increasingly formalized on medicinal tree species. Better scientific capitalization of local knowledge in this area would reduce the delay of the countries of the region in this area compared to the West that benefits more than the conservation of biodiversity in this area without a benefit to the people of Africa.

**The pasture:** permanent pasture in the Sahelian countries of West Africa represents 7-28% of the area of these countries while herd size exceeds 75% of the total area. This level of charge mainly of small ruminants maintains a significant pressure on forest formations. When the dry season progresses and herbaceous forage decreases, animals depend increasingly on leave shrubs that may constitute 50% to 80% of the ruminants. These are the forest formations that form the bedrock of extensive livestock system of the region based on transhumance pastoralists with its share of sometimes-open conflicts between them and farmers.

**The hunt:** Wildlife, next to the flora, has always played a fundamental role in improving the living conditions of the people of the region in various forms: (i) satisfaction of the animal protein needs with the consumption of meat, eggs and honey; (ii) use of spiritual trophies for ritual ceremonies and symbolic and materialization site of special cultural interest; use in traditional medicines trophies, meat, eggs, honey, ground burrows or den, manure, etc.;

handcraft (bags, straps, decoration) and utility (fragrances, crop protection against certain pests, etc.); Use trophies as ornaments etc. at the same time, cross-border trade Trophies and export of birds are insufficiently studied objectively, activities to determine their significance.

#### **2.2.4. Standards, controls and enforcement of forest laws:**

The framework of forest laws in the region is inherited from colonization. Forest codes are primarily instruments to enact operating rules, processing, circulation, filing and use of forest products. They also help to suppress forest crimes through the Water and Forest Service made by sworn officers.

From the 1980s, with the development of community forestry, it has developed a wave of reformation of forest codes in almost all ECOWAS countries to recognize people's involvement in forestry development. During this period, the States have adopted or reformed laws and regulations on the environment and management of natural resources such as the Environmental Code, the Mining Code, etc.

From the point of view of the legislation on the management of forest resources, the trends are similar in the five countries, although the implementation of procedures may differ.

Overall, the forest codes of the countries of the sub region have been revised in recent years to greater empowerment of the people in the development of natural resources. To do this, an almost identical type was adopted to distinguish the status of forest formations:

- Forestry of the state consists of the state-owned forests and classified its name. It includes classified forests, national parks, wildlife reserves and flora, etc. These areas form the core model in the Gambia. In Senegal, the Forest Service has the initiative in these areas even if he may consider granting their development to third parties following a management plan;
- Forestry local government belongs to them in principle, but depending on the country, there is a variation in the degree of their vis-à-vis resources responsibilities. In Gambia, the state is still responsible for managing these areas and local communities (villages) must demonstrate their capacity and willingness to manage these areas to benefit from a protocol that gives them the management responsibility. In Guinea Conakry and Mali these spaces are classified on behalf of the decentralized

communities. This formula may prove ineffective if it is the communities themselves that must initiate registrations. In Senegal these spaces are called soils of forests. These are part of the protected area and management is conferred to local authorities. Their development cannot be done without the permission of local authorities although the state is the guarantor of the sustainability of resources;

- - The private forest estate, consisting of forestland owned by private individuals. This area has been planned for the last reforms to encourage private ownership and individual investment in the forestry sector. In Senegal, the property regarding private plantations does not include land that remains a national asset under the law.

Despite this classification, the property right does not apply to land more often because in these countries, the land still belongs to the State in which the issue of securing investments that arises from private. The private ownership is also now generally addressed in the texts of the forest area. The complexity of the terms and conditions of access to property, however, makes it very imprecise to exercise this right.

In Mali, the institutional environment is enriched to a text organizing rural producer's wooden rural wood management structures, approved by the authorities and the rural wood-energy markets. This has the advantage of strengthening the control of the levy on the resource. Quotas are assigned to the field and to those structures, while in Senegal; for example, it is rather the wood energy traders grouped in organizations that benefit from quotas. They are thus preferred over loggers (not the rest of the indigenous areas of operation).

- The classification of forests globally has helped maintain a level of biodiversity despite frequent transgressions and irregular occupations in which these areas are often subject in almost all countries except in the Gambia where their integrity seems to be better safeguarded. The soils of forests, unclassified host logging, are most affected by degradation. Indeed, exploitation is often accompanied by a deterioration linked to several factors: The operating standards produced are not always based on a knowledge of forest regeneration capacities (imprecision of potential of forests - inventories default forest, ignorance of the productivity of natural forests, etc.); lack of management plan and management of harvested forests;
- The production standards are not always respected by operators (exceeding authorized quotas, non-respect of specifications load, etc.);
- No full implementation of punitive provisions of forestry codes sometimes linked to effective lobbying loggers or corruption;

- The management of forestry disputes favoring an abuse of the transactions at the expense of farms that are more dissuasive penalties;
- The non-application of the provisions of the codes of the countries of the environment in terms of environmental and social impact studies for industrial projects especially in forests.

**Table 2: Nature of the infringements found in Senegal for 2014**

Nature of the offense	Brief explanations of the offense
Illegal logging and cutting	Cutting trees and shrubs without any permit issued by the Water and Forest Service
Illicit carbonization	Charcoal wood processing without the authorization of the service
Hunting in unauthorized area or without license	Hunting in a non-open area to hunt or without a permit
Fraudulent conveyance and circulation of forest products	Transport product (s) forest from point A to point B without a travel permit
Culture, Land clearing, occupation and alteration of the forest estate	Practice of culture, clearing of a wooded area and Build work in an area belonging to forestry
Exceeding permitted quantities authorized	Transportation of forest products amounts above what is in the vehicle license. The most common example is overtaking quantities of charcoal allowed to move by a permit.
Illegal deposit	It is the storage of forest products without obtaining a magazine permit
Pruning and illegal pruning	This is lopping, stripping and cutting of tree branches for livestock feed without the authorization of the Water and Forest Service
Fraudulent exploitation of forest products	These are all actions aimed at exploiting forest products without paying taxes and royalties thereon and without authorization no permit regular operation.
Fraudulent export quotas for	This is the fraudulent exploitation of timber forest products

<b>Nature of the offense</b>	<b>Brief explanations of the offense</b>
timber forest products	including charcoal, made to third countries
Illegal sand mining	It covers all exploitation of sand made outside of authorized areas of operation such careers
Bushfires	This is all voluntary and involuntary acts caused by third parties causing a bushfire
Fraudulent scheme	These are all acts designed to operate and / or transport a timber product without regulatory compliance in forestry and hunting
Forest grazing	It is the fact of graze or spend pets in parts of the forest estate unopened livestock Course
Obstruct the performance of the duties of an agent	It concerns the insulting agent and refusal to obey a person suspected of offenses or false preventing the agent of Waters and Forests to properly do its job

*Source: National Litigation Report of the Forestry Directorate*

The environmental consequences of forest degradation being insidious and usually medium to long term (even if there is the case of rapid and precipitous deterioration) are producing more immediate negative impacts to local economies in general forest crimes that are tended to be trivialized. This is reinforced by the dominance of informal economic activities related to the exploitation of the forest.

The illegal timber trade has now reached proportions that have caught the world's attention on this scourge and initiatives have been taken at the international, regional and national levels. Among the international initiatives include, from the late 1990s, the series of ministerial conferences as the World Bank initiated on issues of law enforcement and forest governance. These have been designed to secure political commitment of States and their cooperation at national and regional levels in the fight against the illegal exploitation and trade and against corruption. They concluded the need to pool efforts and shared responsibility between the timber producing countries governments and importing countries, the private sector concerned, NGOs and development agencies (Maya Leroy et al, sustainable forest management tropical, 2013).

It is in this context that emerged the initiative "Forest Law Enforcement and Governance" or FLEG (Forest Law enforcement, governance and trade), at the ministerial conference of the Southeast Asian country in Bali in 2001. Numerous meetings and discussions have taken place and between policy makers around issues of compliance with laws for the management and governance in the forest sector, including the African initiative in this area in 2003: AFLEG. An indicative action plan was developed by the European Commission in 2003 to support this initiative. Of all the measures it proposes, the FLEGL plan promotes the development of voluntary partnership agreements (VPAs) bilaterally negotiated between the EU and an exporter of tropical wood. It is based on the implementation of a wood traceability system by producing states through licensing, which should allow justifying the legality of the sources of supply of imported timber. Under these agreements, exporting countries must develop devices for verifying the legality of harvesting and timber processing, while the EU is committed to support the establishment or strengthening of these devices. These are based on standards from existing international initiatives: Origin and legality of wood (OLB); Legality and timber traceability (TLTV); Verification of Legal Origin (VLO); Verification of Legal Compliance (VLC); Legal Harvest Verification (LHV); Legality Verification system (LVs), etc.

To date, for the ECOWAS region, only Ghana and Liberia VPAs negotiated with the EU while Côte d'Ivoire, Guinea and Sierra Leone are under negotiation.

#### **2.2.5. Sustainable forest management:**

Sustainable forest management, concept dedicated since Rio in 1992, has become the dominant approach to managing forest ecosystems, particularly in tropical countries, sustainable forest management (SFM), which is supposed to reconcile economic, environmental and social issues, is now mobilized at all spatial scales and by all stakeholders. That's why there are several definitions of the concept, each putting forward different characteristics (Leroy et al, 2013).

1. The International Tropical Timber Organization (ITTO) defines it as "permanent forest management for clearly defined objectives for the sustained production of desired goods and services without undermining their intrinsic value or compromising their future productivity and without causing adverse effects on the physical and social environment "(ITTO 1992 b, cited by Mr. Leroy *ibid*). This definition appears very

utilitarian and forest and is set in a traditional logic that sustained yield and sustainability of logging.

2. Statement of Forest Principles stipulates, for its "Forest resources and wooded areas should be managed on a sustainable basis to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. These needs include products and services that can provide the forest, such as wood and wood products, water, food, fodder, medicines, fuel, shelter, employment creation, a place of relaxation, a habitat for wildlife, a source of diversity in the landscape, as sinks and carbon reservoirs and many other products from the forest. Appropriate measures should be taken to protect forests against harmful effects of pollution (including air pollution), fires, pests and diseases, in order to fully preserve all that is in their price " (United Nations, 1992 b). This definition fully complies with the spirit of Rio interests to list in the most comprehensive manner possible, the resources provided by forests, the dangers they face and the vague recommendations for the preservation of their integrity and variety.
3. Finally, the most widely used international definition was developed in 1993 as part of a consultative process on forests in Europe involving 37 countries. It was chosen by the European Council in its resolution on the action of the European Union (EU) in the field of tropical forests (Smouts *ibid.*). It reads as follows: "Sustainable forest management means the management and use of forests and wooded lands in a way and at a rate, that maintains their biodiversity, productivity, regeneration capacity, their vitality and their potential to fulfill, now and in the future, the ecological, economic and social relevant local, national and global level, and do not cause damage to other ecosystems "(Ministerial Conference on the Protection of Forests in Europe, 1993 cited by Mr. Leroy *ibid.*). This definition provides a relatively dynamic vision that incorporates both the short and long term, acknowledges that there are different levels of possible spatial scales relevant to forest functions and trusted the good forest management to reconcile use and sustainability.

The concept of sustainable forest management has led to decisive innovations in the forest legislation of the countries by introducing more formal and structured concepts of: (i) better use of web tool, taking into account land use plan land, (ii) the generalization of the management plan of forests, (iii) forest management concession subject to sustainable management, (iv) the tax benefits granted to logging companies to encourage sustainable

management (including the conservation and planting: Cote d'Ivoire (1965 Act), Guinea (1999), Togo (2008), (v) legal recognition of participatory forest management: The Gambia (Forest Act 1998, The Gambia Forest Management Concept (GFMC, 2001) .

To study the sustainable management of tropical forests devices, Leroy et al (2013) analyzed a corpus of more than 2000 references that identified three main types of management systems to separate priority issues: (i) devices for improving forestry, (ii) devices to improve carbon storage and (iii) devices to increase the involvement and participation of local populations in the implementation of SFM (cf. following table).

**Table 3 :** The three main categories of sustainable management of tropical forests device

IMPROVING FORESTRY	IMPROVED CARBON STORAGE	INCREASING THE PARTICIPATION OF LOCAL POPULATIONS
<ul style="list-style-type: none"> <li>- Sustainable forest management</li> <li>- Reduced impact logging</li> <li>- Intensifying forestry</li> <li>- Forest Certification (PC &amp; I)</li> </ul>	<ul style="list-style-type: none"> <li>- CDM-Forestry (Kyoto Protocol)</li> <li>- REDD</li> <li>- Voluntary Market</li> </ul>	<ul style="list-style-type: none"> <li>- Joint Forest Management (JFM)</li> <li>- Community Forestry (CFM)</li> <li>- Other forms of participatory management (communal forests, etc.)</li> </ul>

Source: M. Leroy et al, *Gestion durable des forêts tropicales*, 2013

Sustainable forest management is at the heart of all policies and strategies in all countries of the ECOWAS region. This political will has led to the development of participatory management efforts of forest formations and the decentralization of forest management with accountability of local authorities. Instead of specialization according to the sustainable management of devices as described by Leroy et al, experiences developed by the ECOWAS countries combine improved logging and public participation.

Moreover, in each country for local strategies of sustainable forest management have been developed and implemented. Thus, for example, in 2011 Togo has developed its National Strategy for Sustainable Development (NSSD) that offers joint strategic guidelines to all stakeholders of the nation, public and private, and civil society to help structure their own sustainability projects around strategic choices and indicators that have been the subject of a broad consensus. He scored very clearly sustainable management of forests in forest policy and legislation (2008).

However in most countries of West Africa the sustainable forest management is embodied in the participatory management of community forest development, which calls for special rules of operation and management. At the country level, the management methods implemented

have focused on improving forestry and local participation. In The Gambia a community forestry programme was introduced since the early 1990s with the aim to transfer state forest ownership to local communities for enhancement of livelihoods of local people and environmental conservation. Currently over 500 villages are involved in the programme managing about 333 demarcated community forests of over 31, 000 ha (Jaiteh, 2014).

- **Improved forest exploitation:**

o **Improved knowledge of the potential:**

In wanting to implement the option of sustainable forest management, the lack of information on forest ecosystems enabling to establish operations on a sustainable basis quickly became a key constraint. This is why almost all ECOWAS countries have undertaken management inventories as part of the implementation of development projects. These inventories have been made to develop the management plan of natural forests or plantations within the framework of the implementation of domestic energy strategy of the countries (Benin, Burkina Faso, Mali, Niger, etc.), plantation management etc.

o **Better use of geomatics for forest management:**

Inventories often made with advanced GIS tools often give relational databases with an integration of cartographic and alphanumeric data. This allowed in several countries (Mali, Senegal, Benin, Niger etc.) to facilitate the development of management plans through a better knowledge of the resource and its distribution in space.

o **Development Plan Formulation and forest management and the definition of operating standards:**

There was a clear improvement in recent years in the evolution of forest area with a management plan. This has improved the bread samples and greater accountability responsibilities in forest exploitation but also the existence of a means of assessing the exploitation of forest resources. Management plans allow the establishment of technical requirements to be met during the logging. These are often related to:

- The delimitation of areas to contain the cuts before the operation (blocks and parcels) as part of a temporal and spatial programming cuts to follow. This allows a better situation cuts, better monitoring and evaluation and accountability facilitates non-compliance cutting standards;

- Designation of species to cut (e.g. for species of wood energy; after that release operating strains);
- Determination of heights and cutting diameter (facilitating regeneration by rejecting stem, seed conservation of the grove);
- Distribution of the cut on the plot and selecting stems to operate on the clump (avoids large openings and promotes regeneration);
- Erection of protection series in managed forests (protective band around the ponds and wetlands, save laterite outcrops cutting etc.);
- Obligation to use improved carbonization techniques (Casamance wheel that has a weight carbonization yield more dry wood compared to traditional wheel);
- Obligation to make a regeneration effort (enrichment, coppicing etc.) Fight against bush fires with opening fire breaks and fire precocious;
- The establishment of a local development fund managed by local forest management structures to fund restoration activities, protection of the forest. This fund is often made from the fees paid by loggers and administered by a local management committee. It funds reforestation, the fight against bush fires, boundary of blocks and plots etc.

○ **Improved monitoring of the implementation of development plans:**

The development and management plan is a basis for monitoring and evaluation of logging.

○ **Improved public participation of populations:**

Sustainable forest management has enabled the decentralization policies of benefit to empower local people in forest management of their land. Depending on the level of decentralization in the countries of the region, there are notorious developments in the approach and process for developing and implementing management plans and in the organization and institutional arrangements.

○ **Evolution in the approach and the procedure:**

- The deepening of the socio-economic analysis of forest areas to be developed with better mapping of the uses of time by local residents;
- Identifying shortfalls of local people and compensation alternatives;
- Development of investigation methods and participatory diagnosis for better integration of population concerns in the development of massive;

- The social validation of development plans prior to their approval by the administrations.
- **Evolution in the organization for the implementation of development plans**
  - The emergence of a social engineer to organize people around massive arrangement with the establishment of local management structures of populations from villages polarized managed forests;
  - The key erection of distribution of royalties from forest exploitation between government, decentralized authorities and the lively local management structures by local people;
  - The involvement of the population (SLG) in the monitoring and surveillance of forestry;
  - The involvement of the population in the contracts between the State, Local Authorities and loggers for logging.

Sustainable management device to improve carbon storage was less explicitly referred to in the forest management plans developed in the region. Even if the carbon storage of concern is evoked implicitly, it is rather seen as a result of resource conservation with the implementation of development plans. As part of this consultation, the REDD + in the area of CEDEA was treated in a paper dedicated to this issue: regional and international cooperation for sustainable forest management.

Internationally, there is still no specific international forest convention even if a non-legally binding instrument on all types of forests adopted by the United Nations in December 2007 through the International Arrangement on Forests. So far, the international community addresses and finance SFM and through other international agreements (Convention on Climate Change, for the conservation of biological diversity and the fight against desertification etc. OF other conventions also deal with more or less specific forest ecosystems (Ramsar Convention on Wetlands, CITES and the Montreal protocol on preserving the ozone layer, etc.)

In the ECOWAS region, ECOWAS Forestry Ministers and adopted in Abidjan (Ivory Coast) September 12, 2014 a Convergence Plan for the sustainable management and use of forest

ecosystems. The tool aims to strengthen regional cooperation for the protection of West African forests. Among its main objectives:

- Harmonizing forest policy and legal frameworks;
- Participate in initiatives against desertification and land degradation;
- Facilitate the involvement of local communities and decentralized bodies in the management of forest resources;
- Improve the recovery of essential services provided by the forest, including food safety.

Nevertheless shared management and / or forest border is increasing the order of the day due to accelerated degradation of forest resources and awareness of the need for such management. In terms of joint management of trans boundary natural resources and the implementation of the CCD, different countries have developed a number of sub regional and regional nature programs. Among these recent programs and projects include:

- The project Support to Sahel Adaptation Capacities to Climate Change;
- The Early Warning and Forecasting Program of Agricultural Productions in the Sahel;
- Regional Program of Domestic Energy and Alternatives in the Sahel (PREDas);
- Regional Solar Program Phase II;
- Seasonal Forecast for West Africa (PRESAO);
- Projects Mali / Niger and Mali Tintelout / Mauritania / Senegal (Tafacirga area) funded by CILSS;
- Project Supporting Sahelian countries in combating desertification through the Palm Date Palm Culture and Youth Employment;
- Acacia Operation Project (regional project funded by Italy);
- Livestock Development Project of the Liptako Region - Gourma;
- Program against silting in the Niger River valley funded group ADB / ADF;
- The Integrated development of the Regional Program of the Fouta Djallon Massif;
- The Great Green Wall;
- Inter-ministerial Dialogue on Climate Change (Cotonou).

## Recommendations:

The harmonization of the region governance Forest is a vast project that deserves that countries are making the necessary energy to do so. Key recommendations to achieve this can be summarized:

1. Work to move towards a common forestry policy with a focus on:
  - a. Guidance eco geographical area;
  - b. Strengthen cooperation between countries taking into account the comparative advantages of countries.
2. Align and effective forest law and forest taxation favorable to the promotion of sustainable management of trans boundary forest resources (fight against cross-border fraudulent exploitation);
3. Capitalize gains in the policy of decentralization of forest resource management with exchanges and sharing of best practices;
4. Promote a regional program of sustainable forest management.
5. Initiate trans boundary forest management projects for effective and efficient forest resource management and control over transboundary trade on forest produce.

## Conclusion:

The strategic axes of orientation of the management of forest resources at the ECOWAS region are defined in several documents adopted by this institution, the most critical are: the convergence plan for forest management (adopted by the Conference of Ministers of ECOWAS forest area in September 2013), the common environmental policy (2008), the common agricultural policy (2008), the Policy on Energy Efficiency (2012), the Policy on Renewable Energy (2012) etc. These policies generally aim to satisfy the needs of people with sustainable management of natural resources and protection of the environment. Countries in the region primarily dependent on forest resources for energy cooking, the major focus remains the satisfaction of energy needs without depleting resources with promotion of renewable energies in energy balances and access to energy for all.

Land tenure has great influence on the sustainable management of forest resources. The countries of West and Central Africa have given themselves as a major focus, since the Yaoundé International Conference 2009 on Tenure, Governance and Forest Enterprises to

initiate or accelerate the tenure reforms statutory for "legally recognize community ownership of forests and to double the area of land belonging to communities" 2015.

Many countries have also developed institutional arrangements to recognize and secure community rights. Globally all countries of ECOWAS have a strategy to decentralize the management of forest resources and the level of deepening the powers granted to local authorities, we can distinguish three groups. In arrangements in place for the decentralized management of forests States, decentralized local authorities and local communities, the private sector (loggers), civil society and NGOs all play regarding the roles and key responsibilities.

This change was accompanied by a reform of forestry laws that followed the following motion: (i) a centralist vision during the colonial era with the ranking of largest area of forests to meet the needs of the colonizer, (ii) conservation and punishment to preserve spaces despite the pressure of the people after independence, (iii) a right of gratitude to people with participation of population and community forestry from 1980. From 1990, plans forest activities are developed in several countries with the support of development partners (FAO). The major current concerns the influence current reforms of forest codes are rather related to sustainable forest management.

Access to the forest and forest resources remains limited in the forests under the management of the state and highly regulated in the soils of forests. Private forests, even if they are provided in most forest laws of the countries of ECOWAS, the modalities of ownership are sometimes very complex.

Outside the timber, service and wood energy, which play an important role in the economies of the region, the forest offers many products and services that have a significant weight in people's lives (food, traditional medicine, hunting, recreation and cultural services etc.). Given their non-market character or consumption, these products and services are largely unrecognized in both the growth of capital formation in the region.

The exploitation of these forest products and services is made on the basis of legislation enacted whose standards are not always met. This poses a problem of good governance and sustainable management of forest resources and calls: (i) the definition and systematization of good forest management practices, harmonization of policies and legislation for greater cooperation in ECOWAS space.

## CHAPTER III: FOREST TAXATION

### Introduction:

In all ECOWAS countries, the Forest Code usually determines the forest tax system. Thus, in addition to the revenue that the State and other stakeholders can take the forest revenue system, by the imposition of levies and taxes on certain forest products, remains the largest flow monitoring of such products and behavior of each actor.

#### **3.1.Overall view of the forest taxation:**

Natural forests and plantations exploited in the ECOWAS region mostly belong to states with management skills to the decentralized territorial authorities. The operation is almost always liable to pay royalties and forest taxes. Forest revenue systems should be a forestry policy lever to achieve sustainable forest management, by their nature, their plates, their level, sampling methods etc. Indeed taxation had to be a way to influence the behavior of key stakeholders (forest operators, consumers) to induce a movement towards sustainable forest management.

There are several ways to raise revenues in the forestry sector. These are the forest codes that establish tax collection rule and royalties for the exploitation of forest products most often at country level in the region. However, it may happen that other regulations such as decrees (Senegal), joint decree between the Minister of Forests and Finance (Burkina Faso Republic of Guinea etc.), order (.. etc.) define structures these charges. Royalties can be collected, based on the volume of production, the area of forest used, income or profits derived from forestry operations or specific activities related to forests. The fees may vary depending on forest type, the type of product or type of producer. In countries that have funds specifically to

finance various aspects of forest management, taxes can also be collected for other purposes. (*FAO reform of fiscal policies in the context of national forest programs in Africa 2001*).

Mainly in the countries of the region, forest taxation consists of royalties and taxes. The type of product and the quality of the product often determines the level of charges. This is the case of Benin has set fee levels lumber five categories of fuel (depending on the nature or the nobility of wood) and a service-related category of wood, with a differentiation in the level of fee in each category by size (circumference 1.30 m and height of the shaft). In addition to these criteria, the product's origin that is to say the current method of sampling in the forest from which the product is another level of segregation. Thus the level of charges is becoming higher for the same product depending on whether it comes from a forest whose operating system is respectively "uncontrolled", "oriented" or "controlled".

In Burkina Faso, the level of the fee for the exploitation of timber depends only on gasoline except for *khaya senegalensis* for which there's a difference in the level of the fee depending on the type of producer (3,000 FCFA sawmill and 1,500 FCFA for artisans). The fee is based on the foot regardless of size. This form of royalty is observed in many countries such as Gambia, Guinea Bissau, which introduced two categories of gasoline timber and a level of royalty for each species m<sup>3</sup>.

In the Republic of Guinea, the fee level is based on the products and timber is also divided into three categories depending on the species and more royalties planted valuable species. In addition to product charges, there is a fee on the areas granted for exploitation that are paid once a year and clearing fees.

In Liberia, there are royalties on the areas granted to operations, royalties on the timber. Royalties for the production of firewood and charcoal are aligned with those of non-timber forest products. If coal is sold in Monrovia the level of fee is 2.5% of the cost of returns and locally charcoal sold 4DUS per 15kg bag.

In Mali, the fees are set by product and as in Benin, by type of exploitation of forest products "uncontrolled", "oriented" and "controlled". The Controlled is made in demarcated and managed forests, oriented type from undeveloped demarcated forests and uncontrolled type from non-demarcated forests and undeveloped.

Niger's tax system is almost identical to that of Mali and Benin. In Nigeria, the issue of forest taxation is difficult. Indeed, States in which belong most forest areas apply different tax

regimes and forest royalties. At present, the federal government does not have forests and therefore, has not set a tax system.

In Senegal, the level of the fee for the exploitation of timber varies according to the species. The taxable base for the timber is the foot with a minimum diameter of exploitability apparently fixed according to the current use of different species. This threshold is closer to the economic exploitability diameter. There was a gradual decrease diameters of exploitability species mainly exploited for timber. This result from a willingness to stick to the reality of the operation of the timber as a result of degradation of forest resources, subjects of large diameter are scarce and log quality depreciates the measure skimming the forests suffer for decades.

In Sierra Leone, timber royalties are sitting on the exploited wood volume and the class of the species. Timber royalties are payable to landowners and the administration based on the amount of wood harvested trading in-State forests (forest reserves), protected forests (private forests or community forests).

### **3.2. Taxes trends and timber royalties:**

Trends in tax and timber royalties are marked in the region by: (i) setting the charges by product, (ii) charges on the surface and tax for the development of forest industries especially in countries for forestry (Ghana, Liberia, Ivory Coast, etc.); agency fee compensation (clearing); (iii) the distribution of forest revenues between the State, decentralized local authorities and management structures.

#### **3.2.1. Setting charges by product:**

##### **3.2.1.1. Royalties on timber, timber service:**

As explained in the previous chapter, royalties on timber and service are often set based on a categorization of species according to their nobility but also to the dimensions of the products (Benin, Guinea, Guinea Bissau, Gambia etc.). Country reports have not always declined gasoline classes but we can highlight the species that come up in the first class as *Milicia excelsa* (Iroko), *Azalia africana* (ling), *Terminalia superba* (Fraké), *Khaya senegalensis* (Caïlcédrat) *Triplochiton scleroxylon* (Samba), *Pterocarpus erinaceus* (Vène).

- a) The level of charges:

The method of fixing the forestry fee levels for the exploitation of timber (and other forest products for that matter) is often not explained in the texts that set. Even if they take account of prices of final forest products on the market, this is rarely so objectively recover forest rent or cover the costs of development or reconstitution of the forest resource. There is thus a good dose of arbitrariness in setting the fee levels.

The texts that establish the joint taxes are often arrested between Ministers responsible for forests and finance ministers. In Senegal, it is a decree issued by the President of the Republic, which explains that for almost thirty years (1987) there was only one higher fee levels that are passed to the essences of simple value (between 5000 and 12,000 FCFA) more than double (between 10,000 and 30,000 FCFA). There was a desire to reduce inflation recorded during this time of stagnation royalties. This increase did not appear to produce a change in the behavior of the timber operators. Timber resources remain heavily wasted by the production system adopted by most sawyers.

The level of the fee varies according to the species. The value species *Khaya senegalensis* (30.000.fcfa), *Pterocarpus erinaceus* (35,000 FCFA) etc. have higher levels of charges as lower value.

For example, in Benin, the mode of operation (uncontrolled, controlled or directed), the level of royalties Category 1 valuable species varies the following ranges, taking into account the size of the subjects (circumference and height was):

- **Uncontrolled fashion:** from 12,500 to 112,500 FCFA;
- **Oriented fashion:** from 10,625 to 95,625 FCFA
- **Controlled fashion:** from 9,375 to 84,375 FCFA

In Senegal, the current level of charges does not reflect the value of timber estimated from the sawn timber market, let alone the costs of regeneration. They do not reflect the level of scarcity of timber resources in the context of a Sahelian country. This weakness amounts encourages wasteful of resources and the promotion of non-crowns whose wood may represent the next petrol and conformation over 35%. Similarly, the low fees do not encourage millers to invest to increase the material yield. In fact, an important part of forest rent "potential" is destroyed altogether. This applies in many countries. A 2006 study in Senegal found that to approach the residual value of standing timber, royalties should be revalued upward three times more expensive than the level of charges in 2006 (A. NGOM,

Study of chain timber for the reform of forest revenue system in Senegal, WN 2006). This exercise would give comparable results with the charge level of the major issues in uncontrolled operating mode to Benin.

**Table 4:** Evolution of the level of charges (FCFA) value of key species in Senegal

Year	1987		1996		2001	
	Diameter	Amount	Diameter	Amount	Diameter	Amount
Khaya senegalensis (Caicédra)	80	12000	70	30000	60	30000
Azalia africana (Linké)	50	6000	60	25000	50	25000
Cordyla pinnata (Dimb)	60	8000	50	20000	45	20000
Pterocarpus erinaceus (Vène)	60	10000	60	35000	45	35000
Bombax costatum (Kapok tree)	60	6000	60	12500	50	12500
Ceiba pentandra (Fromager)	80	12000	70	25000	60	25000
Daniellia oliveri (Santan)	60	5000	50	12000	50	12000

Source: A NGOM, *Etude de la filière bois d'œuvre pour la réforme du régime fiscal forestier au Sénégal*, WN 2006).

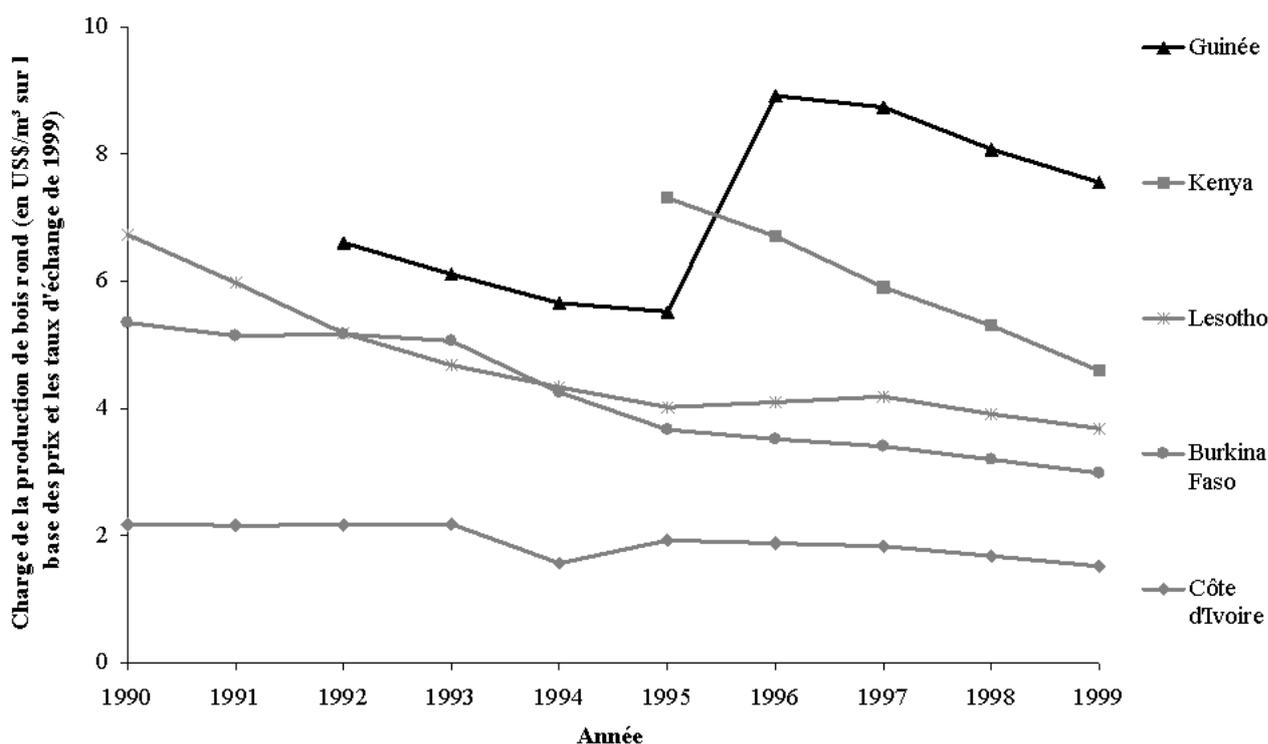
The level of charges in Burkina Faso appears abnormally low;

- ***Khaya senegalensis* (Caicédra)**; 3,000 FCFA to sawmills and 1,500 FCFA for craftsmen;
- ***Borassus flabellifer* (Ronier)** male and female: 2,000 FCFA;
- ***Bombax costatum* (Kapok tree)**: 2.000 FCFA;
- ***Tamarindus indica* (Tamarind tree)**: 2.000 FCFA;
- ***Vitellaria paradoxa* (Shea)**: 2.000 FCFA;
- ***Acacia senegal* (Gum tree)**: 2.000 FCFA.

The legal provisions governing the payment of forest charges and taxes significantly changed in recent years.

In countries where inflation is relatively high and the revisions are infrequent, the actual level of forestry taxes decreases over time because the fixed amounts specified in the scales of charges are eroded by inflation. Moreover, when taxes are revised, large increases are often necessary to compensate for these losses.

The figure below presents information on the evolution of forest royalties from 1990 to 1999 for eleven countries (FAO). These countries experienced a relatively high inflation rate, usually between 4 and 10 percent per year. An exception, Liberia, which had a relatively low inflation rate (2.7 percent on average over the period from 1990 to 1999), due to the widespread use of the US dollar in that country. Furthermore, Ghana, Kenya and Nigeria the average inflation rates were considerably higher (25 percent, 15 percent and 40 percent respectively).

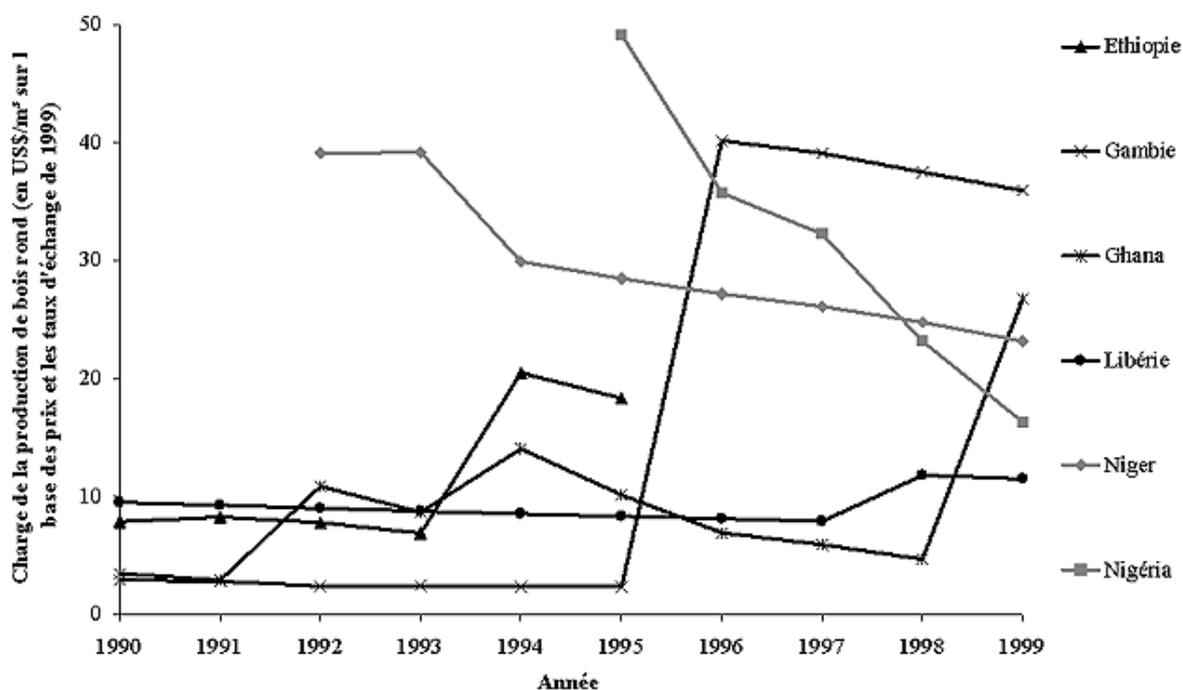


**Figure 1:** Evolution estimated royalties for the production of round wood, 1990-1999, Guinea, Kenya, Lesotho, Burkina Faso and Côte d'Ivoire (US \$ per cubic meter, price and exchange rate 1999).

Figure 1 shows the evolution over the last decade charges on round wood production in several countries where such taxes are less than \$ 10 per cubic meter. For each country, these charts show the average amount of royalties on the production of round wood applicable to major groups of species exploited for the production of industrial round wood in the country. These amounts have been adjusted for inflation, by dividing the amount of royalties each year by the GDP deflator in each country and then converted into US \$, based on the rate of exchange in 1999.

Note that, in a number of cases, the total amount of royalties collected on the production of industrial round wood is higher than the figures shown here because other taxes are also collected as royalties per unit area or taxes on international trade (e.g. Ivory Coast). However, in general, the development of these other charges approximately follows the same path.

The effect of inflation on the real level of forest charges very clear Lesotho and Burkina Faso, two countries that have not revised their forest charges during the period. In both countries, the amount of taxes in real terms fell by almost 50 percent due to inflation. Charges on round wood production increased slightly in Kenya and Ivory Coast, but not keep up with inflation (especially in Kenya, where inflation was very high). The only country where the actual level of forest charges increased during the period is the Guinea because they were strongly identified in 1995. However, even in this case, the effect of inflation is visible and failing a further rise, the increase is eroded.



**Figure 2:** Estimated Evolution royalties for the production of round wood, 1990-1999, Ethiopia, Gambia, Ghana, Liberia, Niger and Nigeria (in US \$ per cubic meter, at prices and at 1999 exchange rates).

Figure 2 shows the evolution of charges on round wood production in countries where the average level of these taxes is greater than \$ 10 per cubic meter. In two countries, Niger and Nigeria, the actual amount of production royalties dropped or by what they have not been identified (Niger) or because they were not increased to an extent enough to offset the effect of inflation (Nigeria). Again, the figure shows that when revisions are made, the increases are often very large (e.g. Gambia in 1995 and Ghana in 1998). Charges on round wood production increased slightly in Liberia, both in absolute and real terms, and their real value was roughly maintained, because their amount is determined in US \$.

The graphs concerning Ethiopia may illustrate the most interesting developments of forest taxes. In this country, the charges were revised in 1993 and since 1995; every state in the country itself determines the amount of its charges. Although it was not possible to present latest graphics due to the diversity of taxes in force today, Ethiopia has started from 1995 to determine fees based on market mechanisms. For example, some states now sell standing timber by auction, by setting a reserve price for the auction, the prices set in the scales of forest royalties. In states where these methods have been used, it is estimated that the average amount of forest revenue collected has increased dramatically since 1995. This presents the opportunity to use the region to market mechanism to determine the level of forest charges.

In 2015, The Gambia has revised its tariff on royalties, permits and licenses for forest produce which was formulated since 1998 except royalty on timber exportation which was annexed to the 1998 tariff in 2006. This revision was done taking into consideration the evolution of market prices for forest produce, rates of inflation, and to add value to forests and its products. the re-export tax of timber established in 2006 was increased from 3000 to 8000 dallassais.

b) The basis of the fee:

In some countries, the tax base is the cubic meter of harvested timber. This plate may seem logical but the difficulty of its use lies in the precision of volume estimates) left foot. Its use requires the availability of high-precision scaling rate that is often lacking due to lack of data.

Benin uses the circumference of 1.30m to 1m amplitude ranges combined with ranges of up to 4m barrels amplitude. This refers to the volume but the estimate of the fee is operational but remains tedious.

### **3.2.1.2. Royalties on wood energy:**

ECOWAS countries still depend on wood energy to meet their cooking energy needs. In Benin, depending on the operating mode, royalties' firewood is 640, 540 and 480 FCFA per cubic meter respectively uncontrolled area, directed or controlled. For the charcoal, they are respectively 550, 470 and 410 CFA per quintal. Considering the low yields millstones carbonization, we can say that firewood is slightly more expensive than wood used for making charcoal that turns out to be a paradox. Indeed, the foundation royalties on finished product (charcoal) does not encourage operators to use high performance wheels. This made the Casamance kiln, as improved wheels were all struggled to be adopted by producers.

In Burkina Faso, wood coal royalties are very low 250 FCFA per quintal while firewood is taxed at 300 FCFA per cubic meter over the management fee paid to 600 FCFA per cubic meter depending on the area.

Royalties of wood energy in the region turn to charcoal, between 0.83 and 1.17 US dollars DEU. Note that countries with experience of participatory management of forests introduced a differentiation favorable royalties managed forests where logging is better controlled. Reduced fees are noted for managed forests that vary between 25% (Benin) and 42% (Senegal) for charcoal. The royalty fee for imported charcoal in The Gambia is 10 dalasis (D10.00) per 50kg bag (1 GMA = \$0.025).

### **3.2.2. Other forestry taxes and fees:**

Apart from these fees paid to exploit that can be compared to the slaughter levy, countries establish other taxes. Forestry taxes can be grouped apart from stumpage in export duties levied by customs services and internal taxes paid to the forestry administration or the field of service. Internal taxes and charges include: (i) the allocation taxes, extension and transfer of exploitation rights, (ii) the area of tax payable annually per hectare of forest area allocated and (i) tax slaughter calculated per cubic meter of harvested timber or feet.

In some countries, the industry must make payments for the achievement of certain infrastructure projects for the benefit of the neighboring local population of exploited populations.

Some countries also implement measures aimed at promoting local business activity and involve more closely national frameworks for the management of operations and wood

processing companies. These measures also provide for: (i) a priority allocation of new licenses for operators coming together in larger units, (ii) investment credits to encourage the establishment of national entrepreneurs, (iii) the obligation of companies with foreign capital to train national technical and management personnel; (iv) the transfer of business units to a new regime intensifying national participation, or state-owned companies at the end of concession period; (v) the implementation of some infrastructure works for the local population.

In Ivory Coast, to allow the supply of local timber processing plants and reduce the strong pressure on the Ivorian forest, Decree No. 95-682 of 6 September 1995 prohibiting the export of raw timber saw and pads, except for wood from plantations entered into force in 1997.

Moreover, to encourage companies to further wood processing, export quotas were imposed on green lumber from 1998. It has, moreover, been obliged loggers proportional to reforest areas the exploited volumes (1 250 ha m<sup>3</sup> operated in forest area and 1 ha to 150 m<sup>3</sup> operated in pre-forest area). These measures have led to a disruption in the structure of production and trade of Ivorian forest products. Thus, log exports dropped sharply, at around 100 000 m<sup>3</sup> in 1999 against more than 3 million m<sup>3</sup> in the early 80s; and the trend is still downward. As for the export of lumber, it has stabilized at around 500 000 m<sup>3</sup>.

It was also noted in several countries in the region e, the institution of compensation fees for land clearance. In Senegal, land clearance can be pretexts for the production of charcoal. Coal produced from the clearing of timber is overtaxed and carbonization must be authorized.

### **3.2.3. The distribution of forest revenues between the State, decentralized local authorities and management structures:**

The decentralization of forest resource management leads to new responsibilities for decentralized territorial communities and populations. The principle of decentralization is based on a transfer of skills and resources to these communities. In the current context of countries in the region, although skills are transferred, the means are rarely or insufficiently.

Before the advent of participatory arrangements, timber royalties or at least part of which was paid to the National Forestry Fund that existed and still exists in many countries (Gambia, Guinea Bissau, Guinea, Niger, Sierra Leone, Togo, etc.). In Niger, the forest fund is provided

in the texts but not yet operational. In Senegal, the national forest fund is still anticipated in the Forestry Code but was removed as a special fund in the budget nomenclature of resources but the funds were transferred to the general budget. In general, the implementation of the forest fund does not resolve the problem of financing of forestry development. Indeed, the available funds are low compared to the challenges of forest development and their use is often not optimal and not subject to monitoring and auditing to ensure the good management of allocated resources. Administered by the public treasury, resources can sometimes be used in other priority sectors in view of the uniqueness of the cash treasury.

Strong from disadvantages linked to the use of forest fund, most countries have introduced a redistribution of charges between the State, decentralized local authorities and local populations organized management structure as part of the implementation of the arrangements equity for the production of wood energy. The allocation keys were established and often participatory manner. Some countries have defined by law or by the forest code these allocation keys (Benin, Guinea, etc.). In some countries such as Burkina Faso and Senegal, distribution keys can be variable from one forest to the other as they precede negotiation between actors.

In Burkina Faso, the distribution varies from forests, since it is negotiated between the Forest Management Group members (GGF) and the promoters of the development. The posts are provided assignments:

- The remuneration of operators:
- A forest management funds:
- The cutting permit (non-negotiable amount as determined by order)
- A village investment fund to finance community infrastructure in Gambia, the

positions of conditions of the funds are:

- 85% of proceeds generated from community forests is retained by the community, 40% of which must be reinvested in the community forest, and 60% can be allocated to projects of community interest

- 15% are paid to the National Forestry Fund

In Mali, the key distribution is variable depending on the origin that is to say the logging mode (uncontrolled, oriented rural market, controlled rural market). The duty stations are planned:

- State budget;
- Development work and maintenance of forests;
- Forestry Control;
- Rural municipalities;
- Regional Chamber of Agriculture;
- Delivery to foresters.

In Niger, the distribution key is also variable depending on the origin and the operating mode of the wood (uncontrolled, oriented rural market, controlled rural market). Assignment posts provided:

- State budget: 10%;
- Budget of local communities: 40%;
- Local Structures Management: 50% to finance the development work and maintenance of forests and forest control.

This redistribution of forest revenues between stakeholders can be a factor of social stability and may also, if the objectives are met contribute to increase the funds available for conservation and restoration of logged forest. However, institutional, technical and socioeconomic remain.

Institutional constraints are related to the fact that the legal basis of the income distribution should be better consolidated with an inscription forest code. If the money that goes to the public treasury for the state and the decentralized territorial Communities obeys formal management mechanisms, one that goes to communities organized by local management structures must be the object management manual to improve governance Local and avoid potential conflicts. Indeed, the list of eligible activities is variable depending on the country. Those are the ongoing development and maintenance of forests and village investment fund that provides funding for community infrastructure. For this fund, it would be important to have a manual that defines among other criteria for selecting projects for funding accepted by all stakeholders. As against the eligibility of certain activities that are found in some countries as compensation for producers, given to forestry agents (Mali) may seem problematic. Also the compensation of Chambers of Agriculture (Mali) from timber royalties should be better documented. Make SLG members of that chamber and pay contributions seems more consistent. The reinvestment of the money paid to the State and the decentralized territorial

Communities in the context of these distribution keys for forest development activities, is often assumed because of the non-allocation of expenses governing budgets.

The technical constraint is related to the estimate of quota share acceptable for each actor. In some countries, the orders have fixed these quote parts authority and this has the advantage of facilitating the transactions and have a relative stability that overcomes at least for a while discussions about the fairness of the key distribution. But the downside of this procedure is to crystallize the aspirations and unmet expectations of stakeholders the key with potential for conflict. The advantage of establishing the distribution key through negotiation in each case is the opportunity for players to re-discuss more easily past agreements. It has the disadvantage of establishing a permanent discussion that does not facilitate implementation. In any case we must find a balance that gives players the opportunity to revisit the achievements consensus on the allocation keys without going to the enlistments.

In Francophone countries, communities do not have the power to create taxes. The law stops automatically an exhaustive list of taxes that local governments are authorized to collect. Past employees may fix the amount at the limit of a ceiling also set by law. This is not the case in other countries where local governments have a setting power to tax and setting the rate. Local governments collect their own taxes and deposit funds in banks. In addition, about resources, constitutions of Nigeria, Ghana and Cape Verde attributed to local authorities a percentage of the total national revenue collected by the state (5% Ghana). In the end, the budget revenue of local governments generally represents a small portion of government revenue - less than 10% (less than 1% in Niger, 6% in Senegal). In Ivory Coast, the fee payable to the Works General Interest (TIG) is calculated on the basis of the area of the detainee perimeter: 48 F / ha per year. TIG are paid annually to the various recipients users with the following breakdown:

- 70% in the Regional Councils
- 20% of local forest services
- 10% to the monitoring committee of management or perimeters

They are payable annually

### **3.3. Analysis of the effectiveness of taxes on the sustainable management of forest resources:**

#### **3.3.1. Effectiveness of forest taxes:**

The tax is intended to supply the state budget: any increase in revenue reduced accordingly the budget deficit and contributes to the country's adjustment efforts. Any additional pressure

on the forest induces revenues and would be good to take at least short term. In the ECOWAS region, it would be important to make a small difference between the countries with rich forestry potential and whose operation is an important source of revenue for the state (Ghana, Guinea, Guinea Bissau, Ivory Coast, Liberia, Nigeria) to the Sahelian country with degraded savannas and steppes whose royalties constitute a congruent part of the state budget.

Forest fees in both forested countries in the Sahel have generally been at a low level that the states still wanted to provide access to the resource to companies operating in the forestry sector was a pillar for economic development and Social countries with forestry potential. On the other hand, given the high dependence of the population on forest products (lumber and service, energy, food, etc.), royalties do not reflect the value of harvested forest resources. To deal with the crisis in the forest sector and in the light of the strategic planning of the sector in the 1990 tax reforms accompanied the institutional evolution.

For lumber, the reform focused on:

- A ban on log exports to counteract the rapid and unsustainable growth of the forestry sector established in the 80s and disadvantaging local wood processing;
- Call for tender procedures for the allocation of resources have been filed;
- Revision of stumpage fees to reflect international prices,
- The erection of a duty payable on the export of sawn timber according to species,
- A value-added tax for sales on the domestic market,
- The removal of duties on log imports and
- A tax on exports of veneer and lumber,
- Infrastructure funding to local populations etc.

For fuel wood, the revision of taxes was made in several countries but with the installation of rural wood energy markets through participatory forest management, there was a redistribution of forest revenues between State and Local Government local people.

The efficiency of the tax system remains limited by:

- The importance of the illegal exploitation;
- The inadequacy of the recovery method (measurement difficult to do on the field, limited staff forest service, etc.)
- The lack of competition in the allocation of resources,
- The monitoring of difficulty and formalization of the distribution of forest revenues between States, decentralized authorities and populations;

- For Ghana future priorities include a process of broader decision making with stakeholder participation, interdepartmental cooperation and a monitoring system logs and products to improve revenue collection.

If we want to at least be levied forest rent, there are instead of adjusting the fees paid for the exploitation of timber to the Market Value of Timber Feet (VMBP). To lay the foundations for a rationalization of levies, it must set up a system based on:

- Charges that link with timber value (prices of final products);
- Correcting the rigidity of royalties (introduction of market mechanisms);
- The adoption of a pricing advantage equitably actors (State, Local Authorities, Forestry experts).

For the determination of charges related to the value of the resource, several methods are used. We expose four methods the last (the method of consultation is less objectively linked to the value of the resource). The following table shows the advantages and disadvantages of these methods.

**Table 5:** Main methods of setting forest charges

<b>Types of Royalties</b>	<b>Advantages</b>	<b>Disadvantages</b>
Royalties based on the market (auctions, through tenders by negotiation)	<ul style="list-style-type: none"> <li>- Suitable products from plantation</li> <li>- In theory allows to obtain the highest price;</li> <li>- Prices reflect sales conditions (quality, accessibility etc.) without the need of calculation,</li> </ul>	<ul style="list-style-type: none"> <li>- Not applicable without real competition (actual buyers, tying);</li> <li>- Need for good product knowledge and understanding of the conditions of sale by the actors;</li> <li>- Difficult to apply in natural forests</li> </ul>
Royalties based on the residual value (assessment of the value of standing timber)	<ul style="list-style-type: none"> <li>- Avoid traps of market failure;</li> </ul>	<ul style="list-style-type: none"> <li>- Difficulties to obtain commercial information of operators;</li> <li>- Residual value for each product type</li> </ul>
Royalties based on the	<ul style="list-style-type: none"> <li>- Research of business</li> </ul>	<ul style="list-style-type: none"> <li>- Difficulties of application in natural</li> </ul>

replacement price	information relates only to the costs; - Adapter for plantations; - Helps determine prices boards in a market system	forests;
Royalties based on consultation	- Promotes consensus in fees; - Takes into account several factors;	- Risk of subjectivism (power between actors); - Stiffness of royalties

### **3.3.2. Forest revenues and public spending:**

The following table shows the level of public spending by governments in favor of the forestry sector in 2005 as outlined in the Evaluation of FAO's Global Forest Resources in 2010 (FAO 2010). Unfortunately, it is difficult to find reliable forestry statistics, which justifies the lack of data for many countries. The general trend that emerges from this table is that forest revenue is generally not sufficient to finance domestic spending in the forestry sector, which requires funds allocated from the national budget. Five of the seven countries for which data on forest revenues and domestic spending are available in this situation. The second trend is that in most cases the majority of public spending on forests is financed by external sources (grants and loans from donors and ONG31). The work of FAO on forest revenue systems in the early 2000s came to the conclusion that the perception of forestry revenue was unsatisfactory in several countries: Liberia, for example, it is estimated that only 30% of revenue to be collected in 2000 were actually. In addition, it was felt that the charges were too low on average, representing only 6% of the FOB value of products for the period 1998-2000 (Doe, 2004). Thus, there are probably potentials in most West African countries to raise domestic funds available for financing the forest sector through more effective systems of revenue collection. Gondo (2010) observed that the introduction of a bidding process for concessions in Ghana has greatly increased the revenue collected from the commercial exploitation of natural forests.

**Table 6:** Forest revenue and public expenditure on forestry in 2005

	Recettes forestières 1 000 \$ US	Dépenses publiques 1 000 dollars américains					
		Financement national		Financement extérieur		Total	
		Dépenses d'exploitation	Paiements de transferts	Dépenses d'exploitation	Paiements de transferts	Dépenses d'exploitation	Paiements de transferts
Benin	3 886	2 451	410	15 925	-	18 376	-
Burkina Faso	607	2 287	-	3 202	-	5 490	-
Cap Vert	-	-	-	-	-	-	-
Côte d'Ivoire	-	-	-	-	-	-	-
Gambie	90	171	0	8 034	0	8 205	0
Ghana	-	-	-	-	-	-	-
Guinée	-	-	-	-	-	-	-
Guinée-Bissau	121	72	-	48	-	121	-
Liberia	-	633	-	-	-	633	-
Mali	692	3608	-	17 640	-	21 248	-
Niger	1 739	-	-	-	-	-	-
Nigeria		4	0			4	0
Sénégal	3 157	6 525	12 323	17 152	15 404	23 677	27 727
Sierra Leone	648	623	0	467	-	1 090	-
Togo	140	-	-	--	-	-	-

Source: (FAO, 2010)

In forest-rich countries, particularly in Liberia and in Sierra Leone can be and also in Ghana, national forest revenues and therefore national public expenditure could reach pretty important amounts. The situation in Liberia, a country rich in forests that are just emerging from a long civil war in 2005, seems to have changed dramatically since the announcement of 633 thousand US dollars of national forest expenditures in 2005. The Liberian Forest Development Authority (Authority planning of Liberia forests) reported on 584,000 US dollars of forest revenue and 3.064 million of domestic expenditures in 2008. The state of Liberia hopes to receive approximately \$ 20 million American per year once the industrial timber sector will be revived, which would represent about 10% of the country's annual budget (Blundell, 2008).

### **3.4. What type of taxation for a sustainable management of resources?**

At the taxation system applicable to conduct a profound change. The foundations of the new system should be based on the gradual introduction of the concept of market value of timber product, including the cost of resource renewal According to this system, which until now applied only produces plantations which must therefore be generalized to the product of all forests, the wood will be sold to the logger using the following principles: indicative reference price may be fixed temporarily by the cost of renewal or market prices that until a free market, competitive moves; the proceeds from the sale will return fully or partially, to the owner of the forest, that is, as appropriate the state, decentralized or local authorities, individual dealers; a device must be in place to encourage or require at least partial reinvestment of revenue in the forest (local forest fund).

This could have incentive effects to local communities and individuals to manage and maintain the forest in all its forms and in all its articles. Indeed, this system is expected to: community awareness in areas where logging is already active, a new use of the bush, and, therefore, the need to protect and manage it. It will be for the forestry administration to help the management and reinvestment of forest revenues into the forest (interesting experiments are underway especially in the Sahel region Burkina Faso, Mali, Niger and Senegal with participatory forest management); encourage and motivate individuals and communities to establish, by planting trees or improving existing natural stands, exploitable forest resources for their benefit; to give the forestry administration the financial means, through light and autonomous bodies, to practice a dynamic productive forestry and forest management.

#### **Recommendations:**

To improve forest taxation and adapt it in the context of the ongoing decentralization in all ECOWAS countries, it is important to:

1. The objective adjustment of the level of taxes and royalties Forest Products operated according to the actual market value of exploited products or regeneration costs; the introduction of market mechanisms (competition) for access to the resource;
2. Define distribution rules and procedures and management of forest revenue between the State, decentralized local authorities and local people;

3. Define areas for harmonization of fiscal policies in the region to promote cooperation between the countries and to avoid distortion especially between bordering countries.

### Conclusion:

In almost all ECOWAS countries, forest taxation was an important instrument to generate revenue for the benefit of States. She played a lesser extent as a lever to influence the behavior of actors in order to produce sustainable management because of their rigidity, their often suboptimal level of their sometimes ineffective coverage. Countries have undertaken tax forms to promote local processing of harvested timber and forest better redistribute income between the State, decentralized local authorities and populations.

To further this reform and allow forest taxation is an element of effective forest policy, instead of:

- Review levels of royalties up to the value of products,
- Improve administration of taxes and fees to increase their efficiency,
- More out of market mechanisms to increase transparency and vitality in the evolution of the royalties,
- Formalize the decentralization of forestry taxation.

The effectiveness of taxation to promote must play an important role in improving the state of the forest resource in the States.



## CHAPTER IV: CURRENT STATUS OF REGIONAL FOREST RESOURCES

### Introduction:

Generally, forests in the ECOWAS area (74.3 million hectares sources: FRA 2010) are highly degraded due to climatic disturbances (drought) combined with human harmful practices namely, (i) mining in forest products, (ii) agricultural and unsustainable pastoral practices, (iii) recurrent bush fires, (iv) the expansion of quarries and (v) increasing urbanization. We are witnessing an accelerated degradation of forest resources, characterized by progressive deforestation and fragmentation of forest ecosystems. Indeed, the annual deforestation level in the ECOWAS region during the period 2005-2010 was estimated at about 871 million hectares of forest, equivalent to an annual rate of 1.2% attrition (FAO, FRA 2010).

#### **4.1. Problem of the classification of forest stands and mapping at regional level:**

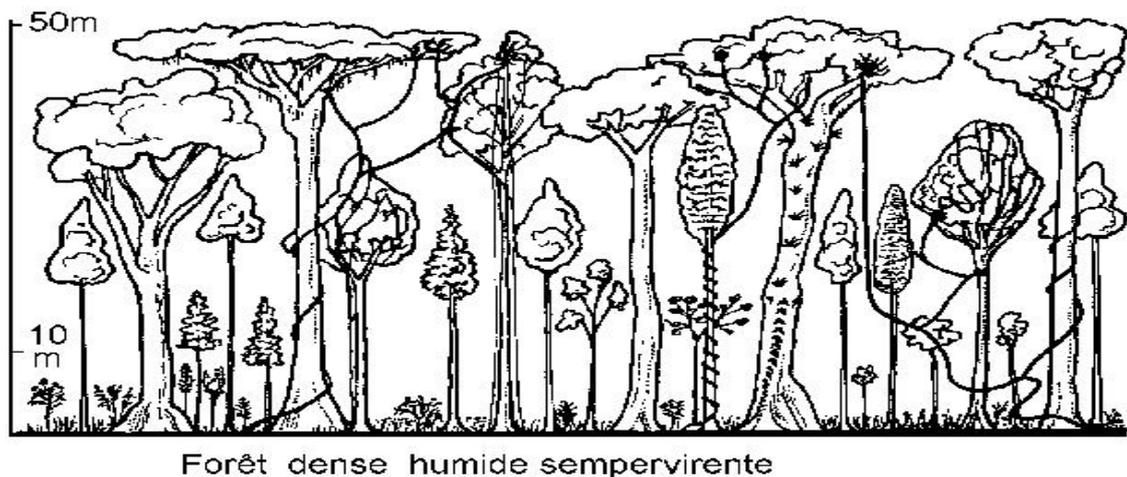
The mapping of forest resources in West Africa is a recent activity that has developed in recent years with the advent of space science and technology. It is mainly based on photo interpretation and / or satellite image classification techniques (LANDSAT for most of the time), uses global data quality and varying resolutions are obtained at different time scales. However, depending on the country, and within the same country there are shades on cartographic methods, resulting in two main types of land used for classification across the region.

##### **4.1.1. Status report on the classification of forest resources:**

At regional level, two types of classification are mainly identified a classification inspired by that of Yangambi (1956) and classification Global Land Cover Network (GLCN) used by FAO. Note that this is the Yangambi classification that is most commonly used in the sub region. It strongly influenced the preparation of vegetation maps in the Francophone countries of West Africa and was an inspiration for many nomenclatures currently used in these countries. In his nomenclature, this classification identifies strata named according to the occupancy rate of the dominant soil. Its main weakness is that to hide the name given to the strata, categories of occupation of secondary or marginal ground as the ground realities almost always refers to cover situations of mixed soil

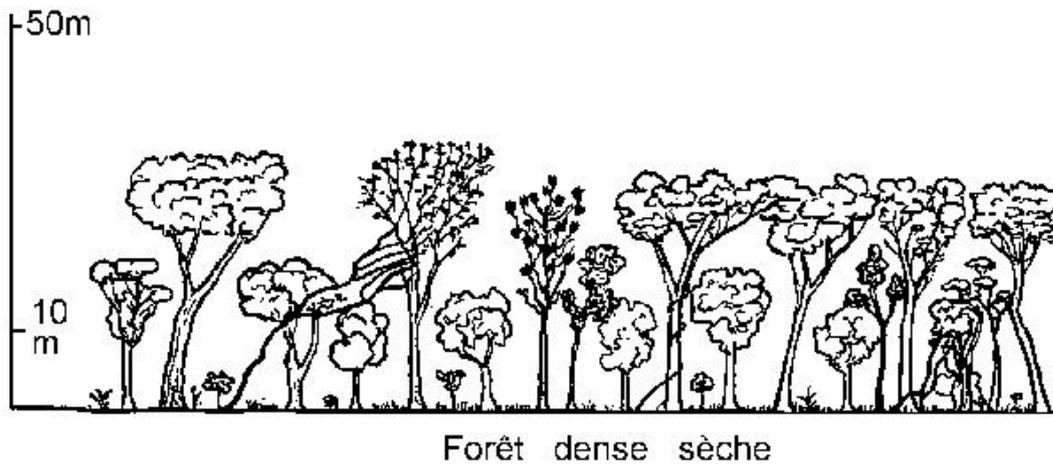
The main classes that make up this nomenclature are:

- **The Guinean rain forest or forest:** It is a closed settlement with trees and shrubs reaching various heights; no grass on the ground, but often suffrutescent plants, more rarely herbaceous forbs broadleaf plants. They are distinguished evergreen rainforest which the majority of the trees still leafy all year and rainforest "semi-deciduous" (or "semi-deciduous") with a high proportion of trees without leaves remains a part of the year. The Guinean forests include all densely forested plains of the countries of West Africa, stretching from Guinea to Cameroon via Liberia. They constitute a portion of the equatorial forests of the Congo Basin. Of all the countries of West Africa, only Liberia is included entirely in the moist forest area.



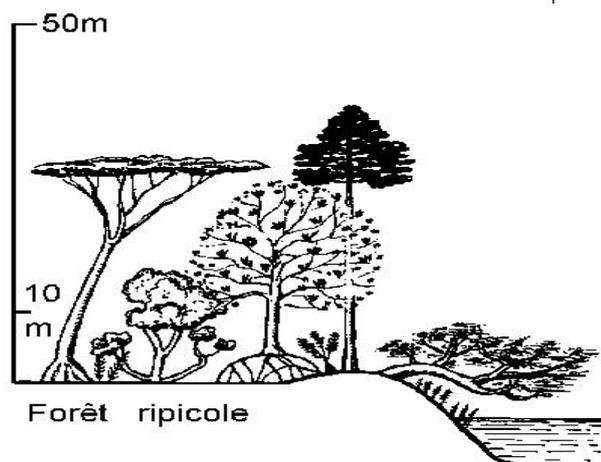
*Figure 3:* Guinean rain forest or forest classification according to Yangambi

- **Dense tropical dry forest:** It is a closed settlement with trees and shrubs reaching various heights (but generally less tall than rain forest); most of the trees on the upper floors lose their leaves for parts of the year (except if they remain evergreen: the dry forest is said to be "evergreen"); the undergrowth consists of shrubs or evergreen or deciduous, and on the ground here and there are clumps of grasses. These dry dense forests stretch from Senegal to South Central African Republic and affecting most countries of ECOWAS. They also experienced a sharp deterioration;



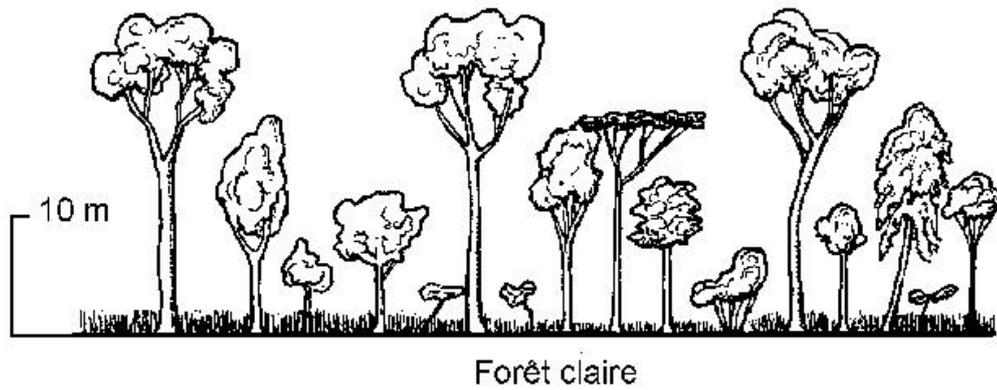
**Figure 4:** Dry dense rainforest Classification according to Yangambi

- **Forests gallery:** these edaphic formations are located along rivers, covered with densities above 80%;



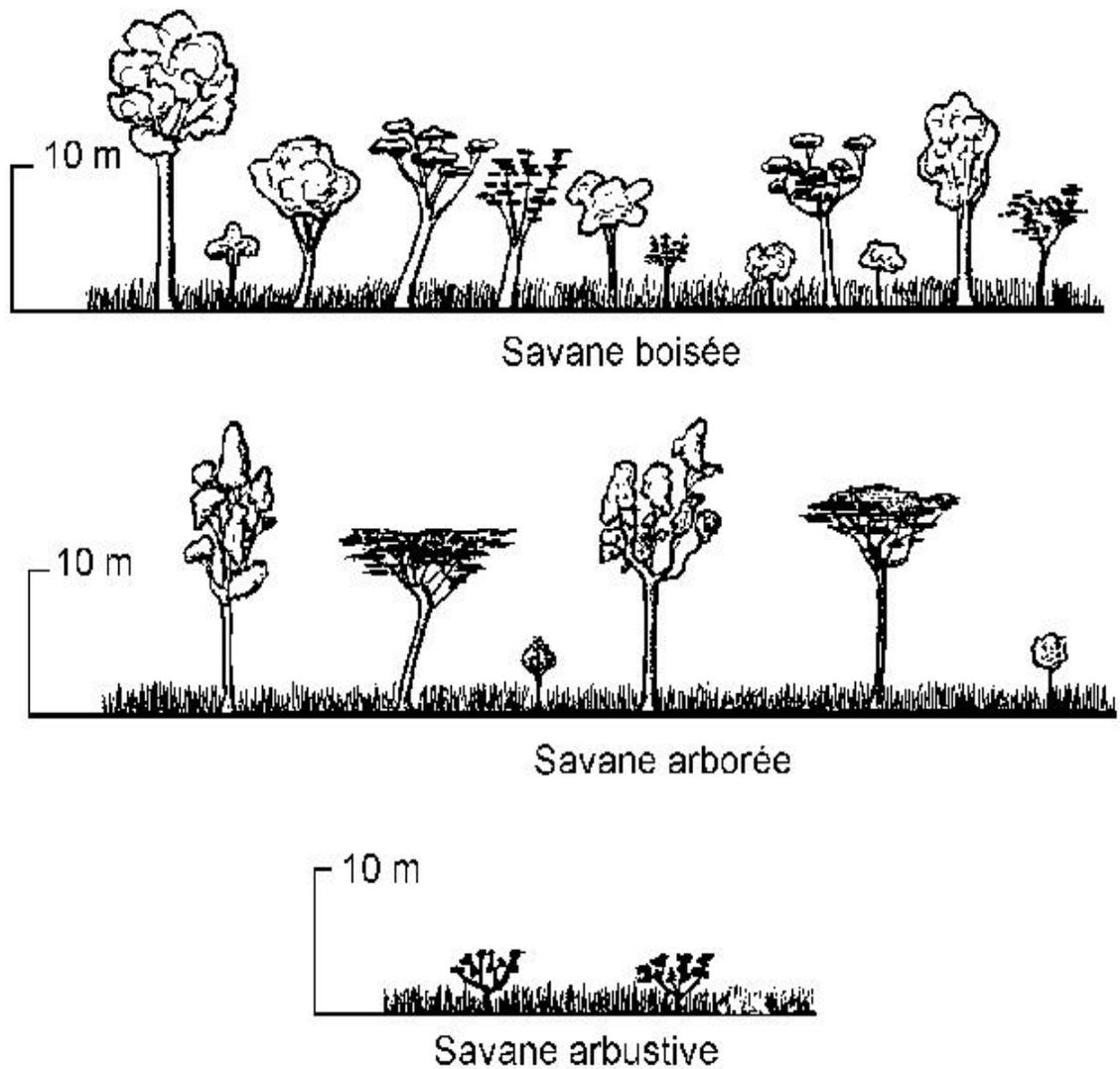
**Figure 5:** Gallery forest classification according to Yangambi

- **Open forests:** stand open with small and medium sized trees whose tops are more or less contiguous, the whole covered largely leaving filter light; ground, grasses are scarce and can be mixed with other herbs or suffrutescent. With the exception of Cape Verde, this type of vegetation is everywhere.



*Figure 6:* Open forests classification according to Yangambi

- **Wooded savannahs, shrubby trees:** grassland with a carpet of grass grassland large measure, at the end of growing season, at least 80 cm high, with flat leaves arranged at the base or on the stubble, grasses and herbaceous plants smaller. These herbs are usually burned each year; this grass cover, meet generally trees and shrubs, which draw a woodland savanna (trees and shrubs forming an open canopy leaving much light pass), a wooded savannah (trees and shrubs scattered on the grass cover), a shrub savanna (only shrubs, grass cover on), a grassland (absent trees and shrubs, grass cover only).



**Figure 7:** Wooded savannah, trees and shrubs according to the classification of Yangambi

- **Mangroves:** these formations, characteristics of tropical and subtropical coastal areas, cover most of the coast of Africa, have always played an ecological, economic and socio-cultural importance in the lives of the coastal populations of the continent. African mangrove covers over 3.2 million hectares, which represents approximately 19% of the world total. However, despite the importance and fragility of this ecosystem African mangroves have suffered enormous pressure over the past decades (regression 20-30%).



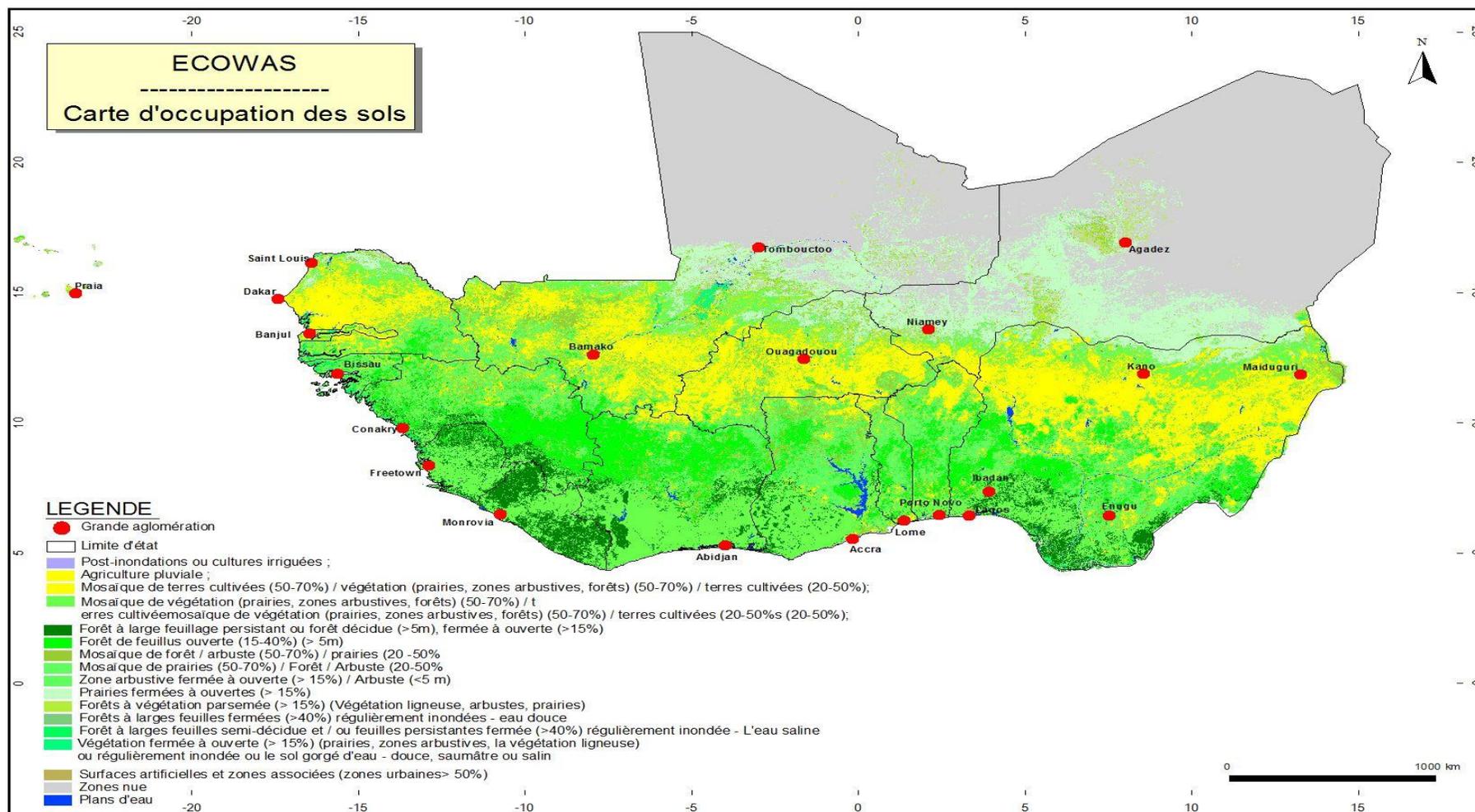
**Figure 8:** Mangrove Classification according to Yangambi

- **Forest plantations:** these are the plantations of Eucalyptus, Teak, Acacia, Prosopis, etc. Some countries such as Cape Verde achieved a spectacular effort in terms of planting. In Senegal for example, large areas were planted in reforestation programs to enrich the classified forests (Tekeraie of Kalounayes) or protective (filao band). The planted forest area in the region reached 2.521 million ha in 2010 (FRA 2010).

#### **4.1.2. Status report on mapping forest formations:**

The two identified sources are regional mapping ECOWAS and the project "West Africa Land Use and Land Cover" (WALULC). The regional map of land use produced by ECOWAS is inspired by the GLCN classification (FAO) and of the draft WALULC Yangambi.

**Map 2:** Map of the occupation of the ECOWAS countries soils (GLCN)



Source: USGS EROS-AGHRYMET and technical partner countries covered (2013)

#### **4.1.2.1. Description of the method Land Use Land Cover (LULC):**

During the last decade, the Sahel countries have made great progress in monitoring the status of their natural resources, judiciously combining field observations and remotely sensed data. Recently, AGRHYMET Regional Centre, US Geological Survey / EROS Center and CILSS have partnered to study the overview of changes in land use of 1975, 2000 and 2013 through a multi time mapping of each CILSS countries.

This helped to highlight the gradual nature of the changes in the use and occupation of land, but the density, quality and plant diversity had recorded significant declines.

The approach is based on a conceptually simple method of production that use maps and land occupation (Land Use Land Cover) in a raster (pixel-based). The USGS / EROS has developed a special tool called Rapid Land Cover Mapping (RLCM) under ArcGIS, a geographic information system (GIS) software. The mapping is done by interpreting the screen interactively usually starting with the most recent period and then going back in time.

A series of maps of use and occupation of land and associated statistics characterizing the landscape changes at regional and national level (12 countries in West Africa except Nigeria) are produced with this method.

#### **4.1.2.2. Description of the Global Land Cover Network method (GLCN):**

The Global Network of classification method of the Occupation of Land and Global Land Cover Network (GLCN) was initiated by FAO in 2002. In this context the African continent has been supported by the AFRICOVER project. . Its objective is to increase the availability and accessibility of a 'standardized and reliable information on the occupation of land on global level and the evolution and the changes. His classification was used for global mapping of land occupation "GLOBCOVER" especially covering the region. Rather, it is descriptive and relies on a classifier called Land Cover Classification System (LCCS) that gives the possible combinations and class association according occupancy. From this classification, few African countries have conducted detailed mapping of land occupation of their country n West Africa, including Senegal.

The advantage of this method lies in the possibility of a classification both at global, regional, national and even local levels. However, the operation of the map information is easier globally, ultimately regionally. Even if the comparison is possible at the global or regional

level, it can become very complex and difficult from one country to another, given the multiplicity of classes.

**Table 7:** Land use classes Method GLCN (Globalcover legend)

<b>Data Codes by ECOWAS (ECREEE)</b>	<b>Corresponding classes</b>
11	Post-flood or irrigated crops;
14	Rained agriculture
20	Mosaic of cultivated land (50-70%) / vegetation (grasslands, shrub lands, forests) (50-70%) / cultivated land (20-50%);
30	Mosaic of vegetation (grasslands, shrub lands, forests) (50-70%) / cultivated land (20-50%);
40	Forest broad evergreen or deciduous forest (> 5m) closed open (> 15%)
50	Closed deciduous forest (> 40%) (> 5 m);
60	Open hardwood forest (15-40%) (> 5m);
70	Closed coniferous forest (> 40%) (> 5 m);
90	Forest open (15-40%), deciduous or evergreen (> 5m);
100	Deciduous forest and mixed conifers, closed to open (> 15%) / (> 5m).
110	Mosaic forest / shrub (50-70%) / grassland (20 -50%);
120	Grassland mosaic (50-70%) / Forest / shrub (20-50%);
130	Shrub lands closed to open (> 15%) / shrub (<5 m);
140	Prairie closed to open (> 15%);

<b>Data Codes by ECOWAS (ECREEE)</b>	<b>Corresponding classes</b>
150	Forests with dotted vegetation (> 15%) (Woody vegetation, shrubs, grasslands);
160	Closed broadleaf forests leaves (> 40%) regularly flooded - freshwater;
170	Forest wide semi-deciduous leaves and / or evergreen closed (> 40%) regularly flooded - Saline water;
180	Vegetation closed to open (> 15%) (Prairies, shrub lands, woody vegetation) or regularly flooded or waterlogged soil - fresh, brackish or saline;
190	Artificial surfaces and associated areas (urban areas > 50%);
200	Bare areas;
210	Water bodies;
220	Permanent snow and ice

*Source: ECREEE*

#### **4.1.3. Comparison of two methods of mapping in ECOWAS:**

The superposition of the land use maps from both methods, including the map produced by ECOWAS (inspired GLCN) and that produced by WALULC project reveals the difficulties of establishing correspondences between classes. Indeed, the classifier GLCN (LCCS) making no distinction between forest, savannah and steppe as defined by Yangambi, savanna areas can sometimes seem like forests. This makes it difficult to compare products (cards).

In ECOWAS, it is mainly from maps of the Yangambi classification (LULC that are used in the context of forest inventories undertaken by the projects and programs. The forest cover maps were produced for this purpose, and served as basis for a better sampling of forest formations during the inventories to their systematic use, and comparison of maps, certain

criteria must be taken into account more or less standardized (i) the extent of the country (Scales) (ii) the basic materials used and their resolution (satellite images or aerial photographs); (iii) mapping of the scales (regional, national or local), (iv) the period or frequency of inventories.

#### **4.1.4. The initiatives:**

Our countries use various classifications for the mapping of occupation and land use. These classifications are often inspired nomenclatures established international, regional or local. The classes that result differ depending on the level of understanding and own assessment for each country. Furthermore, classifications are close either, to that of Yangambi, or that of the World Network of Land Occupancy and Global Land Cover Network (GLCN).

Indeed, countries use classifications adapting them to the realities on the ground, on the scale of work and the objectives pursued in the framework of their projects and programs. Thus we can see that the Burkina Faso Yangambi classification was adopted with a class of combination or sometimes a change of name of the class. In Senegal, Yangambi was used to make management inventories sometimes creating subclasses to better approximate the actual composition of forest formations. To its national inventory, Senegal bluntly creates a nomenclature classified into strata composed of very rich; rich; little rich and poor. Some countries use their own nomenclature defined by a national commission.

#### **4.1.5. Correspondence classes between classification systems:**

It is almost impossible to make a correspondence between the classes of different classifications. Those of GLCN made a description of the environment with associations and class mix. By cons, those of Yangambi individualize the class into a single identifier. Furthermore, we found that the Yangambi classification is more appropriate to the forest inventory for the calculations and estimates of fuel wood.

#### **4.1.6. Harmonization proposal:**

It is not easy to assess the forest resources of the region because training varies from dense forests to steppes through the savannah (woodlands, trees and shrubs). Also, inventory and assessment methods of the resource as well as the classifications used may differ slightly from one country to another. To consolidate data from assessments of countries at a regional level, it is necessary to adopt a harmonization process that may have the following steps:

- The adoption of a consensual classification at two levels:
  - o At regional level, determining inspired classes for Classification Yangambi updated while describing more classes to also characterize a marginal class occupations;
  - o Locally, define sub classes that have more homogeneous groups locally.
- Set levels of accuracy for mapping scale ranges depending on the area covered (large, medium and small scales);
- Use map files of standard and convertible formats;
- Use the same reference system WGS 84 UTM local mapping and geographic (decimal degrees and degree minute second in regional coverage).

#### **4.2. Current distribution of forests in the region and mapping:**

There is great variation in forest area between countries. Nigeria and Mali are the two countries that occupy the largest forest area of West Africa with respectively 13.5 million and 13.1 million ha (FRA 2010). Conversely, Cape Verde with 0,85 million ha, Gambia with 481.000 ha (FAO, FRA 2010) or 423 000 ha (NFA, 2009/10) and Togo with 0.51 million are in the less affluent forest resources.

In terms of percentage of forest cover compared to the total area of the country, Guinea Bissau leads with 60% of forestland and Niger ranks last with only 1%.

The Upper Guinea forest extends from the coastal border of Guinea and covers Liberia, Sierra Leone and parts of Côte d'Ivoire. These forests remain one of the 25 hotspots for biodiversity in the world. They are constantly under anthropogenic stresses to meet energy needs and timber industry, agricultural land and game, etc. Currently only 20% of its surface remains with its original faces, and is highly fragmented. The largest portion of the forest in Upper Guinea is located in Liberia, where conservation is seriously threatened.

On the statistical data on forest plantations, they are unreliable for lack of inventories and lack of management. But to point out that in countries such as Côte d'Ivoire, Benin and Nigeria, industrial plantations of efforts have been made. In the Sahel, they are of non-industrial origin and are less important except in Senegal; here, these plantations are generally created to stop the process of desertification, protect coastal ecosystems (filao band), and enrich the southern natural formations.

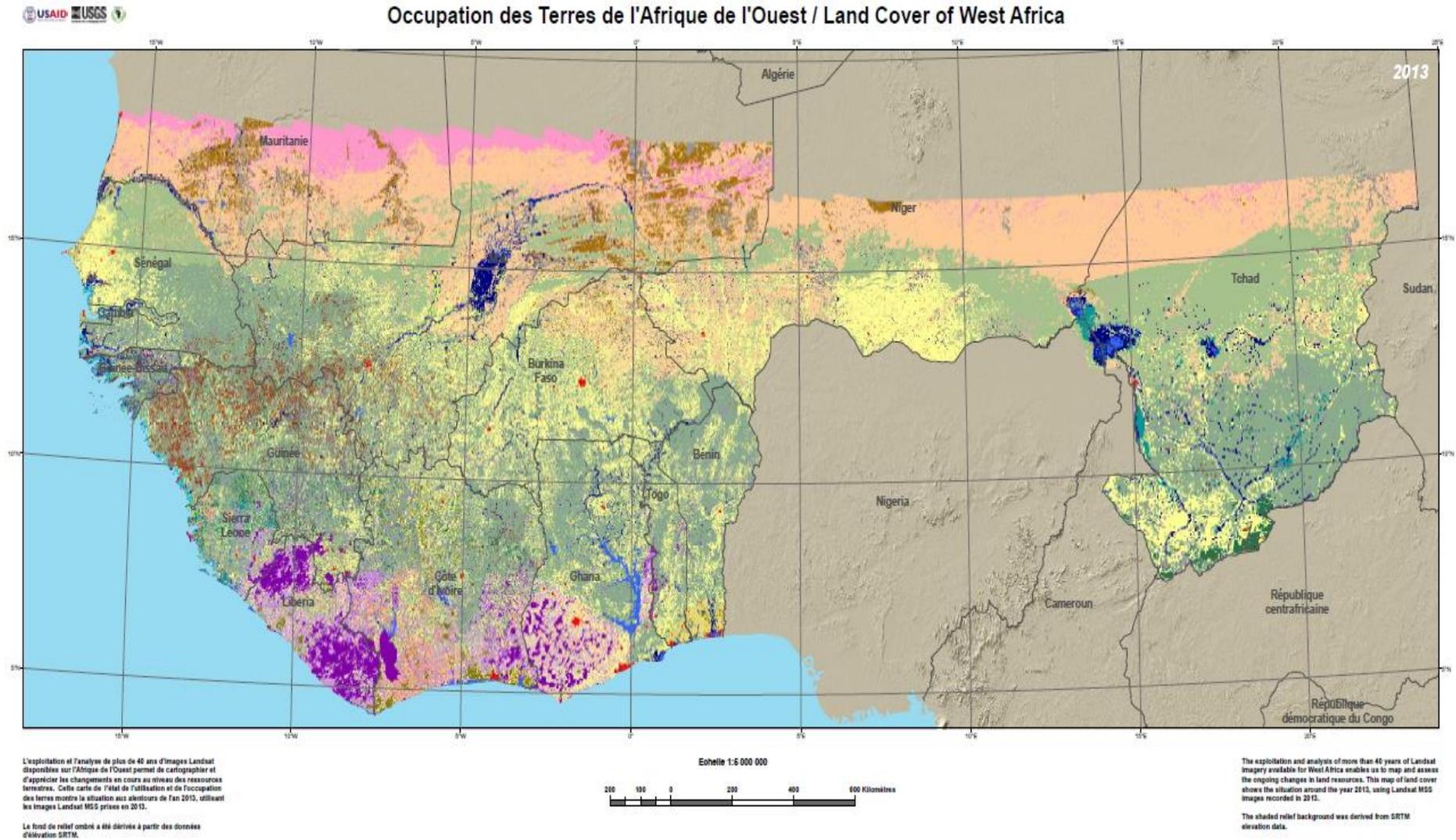
The following table shows forest area by country.

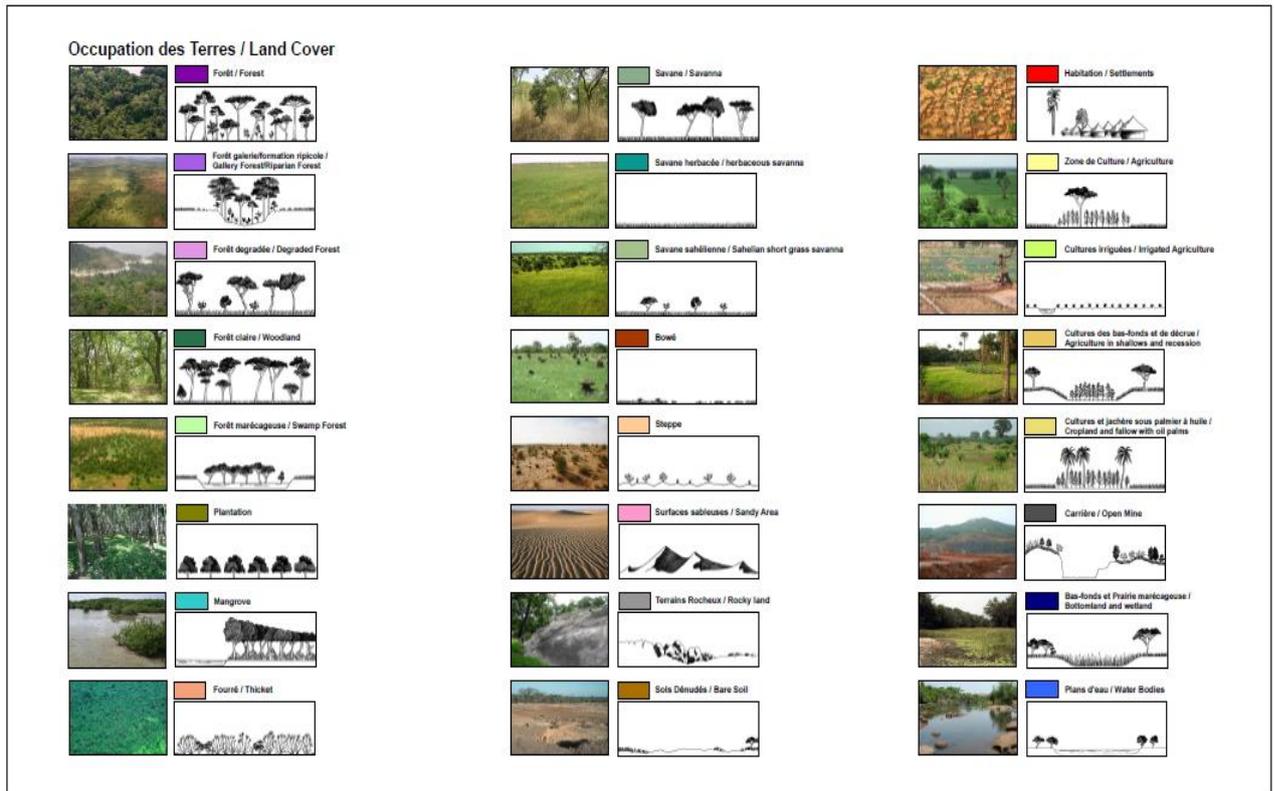
**Table 8:** Distribution of forest area by country

Country	Area
Benin	4,561,000
Burkina Faso	5,649,000
Cape Verde	85,000
Ivory Coast	10,403,000
Gambia	480,000
Ghana	4,940,000
Guinea	6,544,000
Guinea Bissau	2,022,000
Liberia	4,329,000
Mali	12,490,000
Niger	1,204,000
Nigeria	9,041,000
Senegal	8,473,000
Sierra Leone	2,726,000
Togo	287,000

<b>Country</b>	<b>Area</b>
<b>Total/Average</b>	<b>91,589</b>

**Map 3:** Map the occupation of the land in the countries of West Africa





**Figure 9:** Caption of the map of land use in the countries of West Africa

### **4.3. Inventory methods of forest timber potential:**

Among the ECOWAS countries, Benin, Burkina Faso, Mali, Niger, Nigeria, Senegal and Togo have capitalized the most experience in forest inventory with the use of several methods developed based on the desired objectives. In terms of other countries, the recorded experiences are often isolated and are carried out as part of research projects or research. According to the country reports, Guinea and Cape Verde have not realized forest inventory at national level. The available results are from extrapolations from partial inventories. This does not allow for reliable and timely data on forests and forest resources.

The methods used vary according to the size of the inventory produced (national, regional, local) or objectives (estimated wood potential for the development of forest management plans, assessment of biodiversity, estimated carbon stocks etc.). In all cases, these inventories are characterized by: (i) the type of sampling used, (ii) the device (size and shape of plots); (iv) recorded information, (v) the methods of treatment of the data collected.

- **Sampling:**

The inventory sampling is the most common method used in the region to assess the potential of woody forest formations. This type optimizes inventory costs to assess the potential of vast forest massifs. The two most common methods are (i) simple random sampling: the device plots are drawn randomly, (ii) systematic sampling: sampling units are chosen uniformly over the population (according to a regular pitch).

In Benin, for example, at national level, a systematic inventory sampling was carried out by placing a grid of 15 km x 15 km, based on the projection 'UTM 31 N' of the reference ellipsoid WGS 1984 on all 112 622 km<sup>2</sup> that covers the country. At each corner of the square mesh is a permanent sampling unit.

In Burkina Faso, it is simple random sampling was used mainly as part of the inventory conducted from 1980 to 1983 with the support of UNDP and FAO, and the National Forest Inventory (NFI2) underway since 2012 through the Project "Second National Forest Inventory - 2 IFN" (Project BKF / 015), with the support of the Grand Duchy of Luxembourg. To increase the likelihood that each town is represented in the device of the sampling units, it was adopted systematic sampling plan to generate the population of points, which will be subject to simple random sampling for selection of units sampling. It follows that the number of dots per area is proportional to its surface.

Two mesh sizes are adopted. It is the mesh 5 km x 5 km and the mesh 3 km x 3 km. The total number of the points is respectively 10 816 and 30 061 excluding points within water bodies, urban centers, mines and quarries from the Occupation of Land Database (BDOT 2002). The sample size resulting from the pre-inventory is therefore distributed according to the surface areas of phyto.

In Mali, Sylla (1998, 2001) and Kouyaté (1995) conducted tests respectively on the rapid forest inventory sampling method with variable size plots and the forest inventory method by sampling number of trees defined. The two methods were tested in Burkina Faso (Kabore 2006).

In Nigeria under the National inventory, a grid of 10 km kmx10 is superimposed on the forest. In each southwestern corner of the grid squares, clusters of 1 km x 1 km were created. Each cluster consists of four sectors located 200m x 200m 600m corners. In each sector, four 50m x 50m plots were established in the corners and used as recording units for the measurements. Each cluster is made up of 16 plots (registrars).

- **The device (size and shape of plots):**

The shape and size of the observation units are linked to the nature of the data collected. They remain a core issue for the characterization of forest resources (Hush et al. 2003), especially the determination of the optimal size of plots (Atindogbé et al. 2011), which particularly affect the accuracy of the estimated parameters (Fonton et al. in 2011).

In the sub-region, several inventories devices are used with varying sizes and shapes squares.

In Benin, for example, circular plots (better relationship between surface and its perimeter, and thus limiting the number of boundary trees) were used in the context of the national inventory. Each sample unit was divided into three sub-samples as a function of the density of vegetation to be measured: (i) one (01) of radius 18 m for all the sample trees whose DREF is equal to or greater than 10 cm. (ii) one (01) of radius 4 m for all samples including trees and shrubs DREF is between 3 and 10 cm; (iii) four (04) subplots circular radius of 1 m for effective regeneration, that is to say, for every tree / shrub whose diameter is less than 3 cm and whose height is greater than or equal 1.3 m. This same model was used in Senegal, but with plots of 20 m radius.

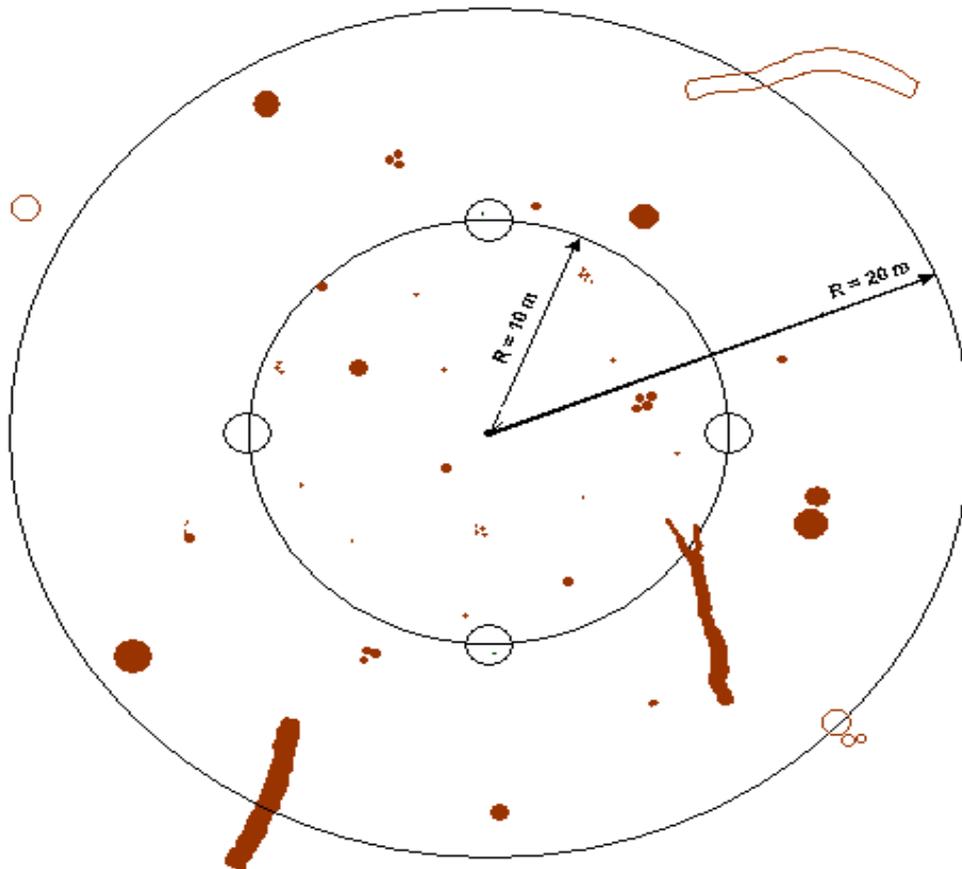
In Burkina Faso, the choice of the shape and size of observation units is based on three levels: (i) first level with circular plot of 25 m radius; (ii) second level whose observation unit is a plot of 3 m radius concentrically to the plot of the unit the first level (iii) Third level concerning herbaceous biomass with a set of four plots of 1 m<sup>2</sup> placed by each cardinal direction 10 m from the plot center.

For the specific case of plantations, the most common form is the circular shape because it keeps all the objectivity of the spatial representativeness of trees. As for the surface, it ranges from 100 m<sup>2</sup> to 600 m<sup>2</sup>. The circular plot of 6 acres (600 m<sup>2</sup>) is used.

In Senegal, also as part of the national inventory, the device was adopted:

- ✓ One (1) plot of 20 m radius centered on the sample point for the measurement:
  - Living wood and stumps with a DREF 20.0 cm and more,
  - Of standing dead trees with a DREF of 3.0 cm and a total height of at least 0.7 m, and
  - Deadwood lying to a cut of 3.0 cm with a length of at least 0.5m
- ✓ One (1) plot of 15 m radius and centered on sample point (concentric to the first) for the measurement of living wood and stumps with a DREF 10.0 cm to 19.9 cm

- ✓ One (1) plot of 10 m sample point centered radius (concentric with the first) for measuring living wood and stumps with a DREF of 3.0 cm to 9.9 cm
- ✓ One (1) cluster of four (4) plots 1 m radius whose centers are within 10 m of sample points following the four cardinal points for counting regeneration (DREF timber with less than 3.0 cm);



**Figure 10:** National Inventory Device of Senegal

- **Sample size:**

To calculate the number of sample units, based on the experience of forest inventory conducted in the region (Ghana, Niger, Mali, Senegal, Gambia), the following formula is commonly used:

$$N = \left( \frac{CV\%}{e\%} * t \right)^2$$

Where:

- *N* is the number of sample units to be measured;
- *CV%* is the coefficient of variation of the variable considered for the calculation;
- *e%* is the standard error attached to the variable, i.e. 10%
- *t* is the value of the variable *t* of Student, which is 1.96 for a probability level of 95%

- **Types of information collected:**

The information collected will vary according to the objectives of the inventory. Indeed, if one attaches great importance to the diameter and the height under the management inventories for timber production, these parameters remain less important for biodiversity inventories that emphasize the floristic composition of populations and densities specific species. In general the information gathered is related to: (i) the characteristics of the station (soil type, slope, accessibility, disruption indexes etc.), (ii) dendrometric parameters (diameter, height, etc.).

- ✓ **Dendrometric settings:**

This is primarily the diameter, circumference and height that can be taken at varying levels depending on the intended objectives and the desired level of precision.

In almost all countries, the diameter of pre count as part of the national inventory is 3 cm.

Given the irregular shape of the individuals in most forest formations of the region (natural forest), the circumference is measured instead of the diameter for better accuracy of data for some countries (Mali). In Senegal, management inventories often measure the diameter but the circumference is measured for forest inventory to estimate carbon stocks. The diameter and circumference are often measured at 1.30 m from the ground (reference level). It was noted that in Nigeria, the diameter is measured at the base, at chest height, and in the middle.

For the height we note: (i) the total height, (ii) height was (strong wood height).

- ✓ **Station parameters:**

This is mainly biophysical parameter of the plot. This data is collected to better contextualize the data and the results of the inventory.

In Senegal, for example, as part of the national inventory, apart from measurements made on trees, data on environmental and economic characteristics of the station at the sampling units

were identified. These are: the altitude, slope, (exposure, (iv) the type of relief, (v) the absence / presence of a breastplate, (VI) texture of the first and secondary fraction as well as soil depth; (VII) signs of erosion and livestock accessibility.

- **Harvested Data Processing Methods:**

With the advent of geographic information systems, most countries of the sub region have a computerized system for processing inventory data (Senegal Benin, Togo, Burkina Faso, Ivory Coast). Timber volumes are often estimated from scaling rate achieved in different countries. These rates may be one or more entries. The calculation of these variables timber volume, basal area, density etc. could also be important elements for the characterization of stands and refinement of their classification. The different rates used are appended.

- **Forestry potential and its distribution in the region:**

It was difficult to consolidate the forestry potential of the ECOWAS countries from reports provided by countries for several reasons: (i) the variables used are not the same for misusing the potential (strong timber volume, volume under bark, total volume etc.) (ii) The results supplied do not cover the national level, but rather part of the country having been the inventory object. That's why the most consistent source found was the FAO FRA report is based on an assessment of global forest resources based on two main sources of data: (i) national reports prepared by national correspondents and data Remote Sensing analyzed by FAO in collaboration with national focal points and regional partners. The table below shows the breakdown by country of the potential:

**Table 9:** Distribution of forest area in the ECOWAS

Country	Forest area	Planted area	Timber volume in m3	Volume in m3 / ha
Benin	4,561,000		161,000,000	35
Burkina Faso	5,649,000		237,000,000	42
Cape Verde	85,000		12,000,000	145
Ivory Coast	10, 403,000		2,632,000,000	253

Country	Forest area	Planted area	Timber volume in m3	Volume in m3 / ha
Gambia <sup>1</sup>	480,000		18,000,000	37
Ghana	4,940,000		291,000,000	59
Guinea	6,544,000		506,000,000	77
Guinea Bissau	2,022,000		61,000,000	30
Liberia	4,329,000		684,000,000	158
Mali	12,490,000		246,000,000	20
Niger	1,204,000		12,000,000	10
Nigeria	9,041,000		1,161,000,000	128
Senegal	8,473,000		316,000,000	37
Sierra Leone	2,726,000		109,000,000	40
Togo	287,000		ND	ND
<b>Total/Average</b>	91,589		<b>81,970</b>	<b>77,630</b>

#### **4.4.Dynamics of forest stands in the region:**

During the period 2000 - 2010, with the exception of the Gambia (FAO data, according to national source, In 2009/10, Gambia has lost a total forest area of 97, 400 ha compared to 1997/98 figure) Ivory Coast and Cape Verde, all other ECOWAS countries have had a negative change in forest cover, Niger (12 000 ha / year), Nigeria (410 000 ha / year). The table below shows the situation by country.

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<sup>1</sup> National sources : forest area : 423,000 ha, timber volume in m3 : 1,666,400 ; volume in m3/ha: 4

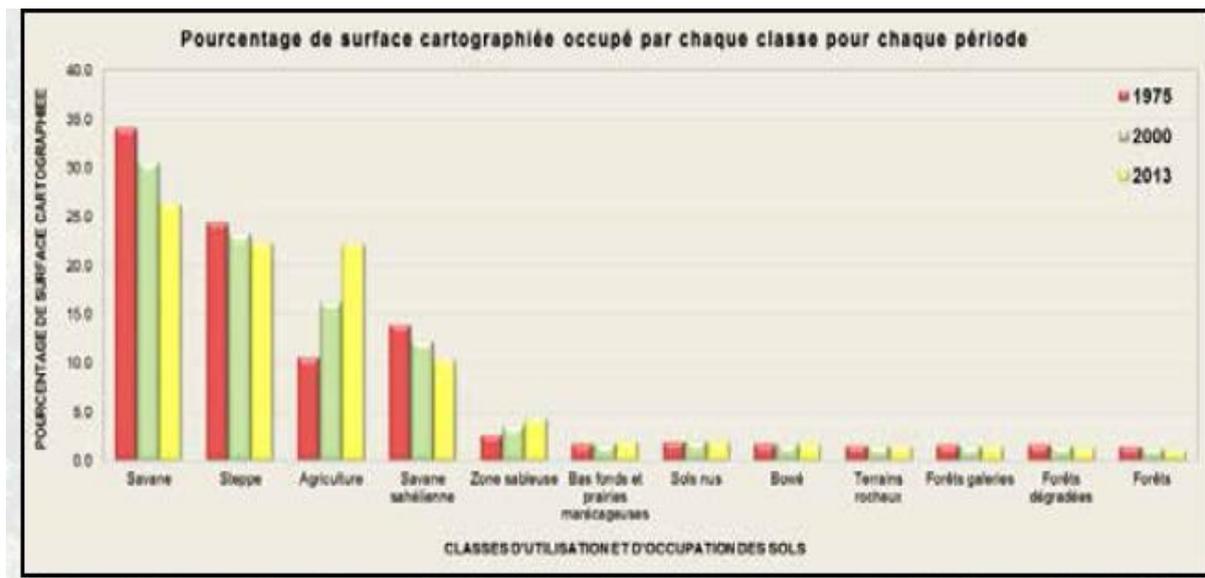
**Table 10:** Evolution of forest areas in ECOWAS between 1990 and 2010

Country	Forest area (X1000 ha)				Annual change rates					
	1990	2000	2005	2010	1990-2000		2000-2005		2005-2010	
					X 1000ha/ha	%	X 1000ha/ha	%	X 1000ha/ha	%
Benin	5761	5061	4811	4561	-70	-1,29	-50	-1,01	-50	-1,06
Burkina Faso	6847	6248	5949	5649	-60	-0,91	-60	-0,98	-60	-1,03
Cape Verde	58	82	84	85	2	3,58		0,36		0,36
Ivory Coast	10222	10328	10405	10403	11	0,1	15	0,15		
Gambia <sup>2</sup>	442	461	471	480	2	0,42	2	0,43	2	0,38
Ghana	7448	6094	5517	4940	-135	-1,59	-115	-1,97	-115	-2,19
Guinea	7264	6904	6724	6544	-36	-0,51	-36	-0,53	-36	-0,54
Guinea Bissau	2216	2120	2072	2022	-10	-0,44	-10	-0,46	-10	-0,49
Liberia	4929	4629	4479	4329	-30	-0,63	-30	-0,66	-30	-0,68
Mali	14072	13281	12885	12490	-79	-0,58	-79	-0,6	-70	-0,62
Niger	1945	1328	1266	1204	-62	-3,74	-12	-0,95	-12	-1
Nigeria	17234	13137	11084	9041	-410	-2,68	-410	-3,33	-410	-4
Senegal	9348	8889	8673	8475	-45	-0,49	-45	-0,51	-40	-0,47
Sierra Leone	3118	2922	2824	2726	-20	-0,65	-20	-0,68	-20	-0,7
Togo	685	486	386	287	-20	-3,37	-20	-4,5	-20	-5,75
<b>Total/Average</b>	<b>91589</b>	<b>81970</b>	<b>77630</b>	<b>73236</b>	<b>-962</b>	<b>-0,852</b>	<b>-870</b>	<b>-1,016</b>	<b>-871</b>	<b>-1,27071429</b>

<sup>2</sup> national sources provide slightly different data

*Sources: FRA 2010*

The project WALULC has made an important analysis of the dynamics of land use in West Africa for the periods 1975, 2000 and 2013 based on interpretation of satellite images. This analysis highlights the impressive changes in land use and land cover in the last 38 years. These changes are also quantified on the graph on the following Figure compares the ruling classes of zoning, as a percentage of the total area mapped for three periods.



**Figure 11:** Evolution of land use in West Africa.

These changes concern particularly the conversion of forests, woodlands, savannas and steppes in rained agricultural zones. For example in Senegal, we note extension of the groundnut basin to the wooded areas of central and southern fragmenting natural landscapes. The south of the country, Casamance, is a victim of particularly rapid change such as the conversion of forestland to cropland and fragmentation of savannas (forest occupation classified Pata).

In Mali, the Sahel such as the Gourma, the Akle Azawad and Tilemsi remained relatively stable, with the exception of the Kaarta region that has seen an expansion of cultivated land in traditional pastoral areas. Significant changes are also visible in the Sudanese region of Mali, where the development of agriculture has led to the fragmentation of the savannah. The cotton basin and plains of Seno are saturated today by an almost continuous agriculture. However, the most dramatic changes in the Sahel countries can be observed in Burkina Faso. Comparing the landscapes of 1975, 2000 and 2013 of this country, it was observed the loss of high-biodiversity habitats such as savannahs, woodlands and gallery forests for agriculture. Only a few protected areas are spared by this wave of land conversion. The Niger reveals relative

stability of the landscape. However, further observation reveals significant changes. Fueled by rapid population growth and increasing demand for food, agricultural expansion is probably the most significant change in the landscape of Niger. Yet in Niger it has been documented by the project one of the great environmental success stories in West Africa, including successfully assisted natural regeneration initiated by farmers in the vast agricultural area Goulbi.

In Guinea Bissau, a small loss of forest cover is observed, including mangrove forests, for the benefit of the crops. Guinea has the largest bowé surfaces (i.e. fossilized grass meadows or laterite soils). The bowé landscapes are among the most stable in West Africa, offering natural pastures for wildlife and livestock. Agricultural expansion occurred rapidly in some regions, particularly in the southeast, exercising strong pressure on the remaining dense forests of the Highlands of Guinea. On the other side of the border with Sierra Leone, some vestiges of the Guinean forest zone still today limited to less than 2% of the national area.

Liberia stands out of other countries in West Africa by the extent of its dense forest covering 37% of the national area. Further east, Ivory Coast, the 1970 Landsat images show large dense forest areas, but in 2013 only a few remnants of these forests are still visible, with the exception of the Tai Forest.

The changes in the landscape of Ghana are among the largest and fastest in the region. The agricultural expansion rate is unprecedented in the history of the country, invading all other land use classes, including savannas, woodlands, and dense forests. Outside protected areas, the dense forests of southwestern Ghana have been fragmented and degraded.

In Togo and in Benin, very few of the former vast dense forests remain. However, some gallery forests persist and continue to preserve part of the biological diversity of the Guinean area. As in most of the region, agricultural extension is increasingly rapidly in these countries, and grows along major transport routes. Protected forests and Pendjari National Park in northern Benin provide protection for the last few continuous stretches of woodlands of the Sudanese region of West Africa.

At the regional level, we can distinguish three main changes that we discuss below: (i) the expansion of agriculture: it induces a significant expansion of cultivated areas in all West African countries. Indeed between 1975 and 2000, agricultural land increased from 10 to 16% of the total area mapped (10 countries). Then, in just 13 years, between 2000 and 2013, cultivated areas have still increased further by 6%. Behind this increase in cultivated surfaces hide more than just numbers. Indeed, the conversion of agricultural land surfaces often a radical

transformation of landscapes and natural habitats with high biodiversity of the poorest land cultivated permanently. (ii) Reduction, degradation, and fragmentation of forests: forests (rain forests, dense evergreen and deciduous in Guinea, Sierra Leone, Liberia, Ivory Coast and Ghana), and gallery forests (located in the valleys wet) are habitats with the greatest biological wealth in West Africa.

The "degraded forests" consist of dense old deciduous forests, modified and degraded by human activities. They are mainly present in the margin of reserves and protected areas, and are particularly visible in Ghana. The "open forest", dispersed in the Sudan region, is characterized by a denser canopy, as well as higher productivity and biodiversity than the savannah.

Gallery forests, degraded forests and dense forests continue to disappear, from 94 000 km<sup>2</sup> to 76 000 km<sup>2</sup> between 1975 and 2013 (all classes).

In 1975, clear-cuts and fragmentation of tropical rainforests of the countries of the Guinean forest region was already well underway. In 2013, the massive cutting of these forests for the benefit of cocoa crops and other uses has reached a high level, leaving and biological reserves as last relics of these rich forests with high plant and animal biodiversity, which once covered most of southwestern Ghana until the 1960s gallery forests have also seen their significantly reduced surface mainly because of cuts related to agricultural expansion. The slash and burn culture still widely practiced, logging, recurrent bush fires, and more recently the opencast mines are the main degradation factors that have greatly reduced the extent and changed the composition of forest habitats.

These land use changes are accompanied by a profound change in ecological agro ecosystems with sometimes drastic decline in productivity leading to lower yields and agricultural and pastoral productions, plunging people into a vicious cycle of impoverishment. This poverty often induced displacement of populations with their corollary of potential conflicts, shantytowns of African cities and social precariousness vulnerability.

#### **4.5. The main threats to forest resources:**

The forest resources of the region are threatened by a combination of factors including: agricultural expansion, commercial crops, increased fuel wood collection, overgrazing, increasing urbanization, industrialization, drought, conflicts and bushfires. Rapid deforestation in the sub-region is a serious concern at the extent of the deterioration that began in the 1970s. These factors resulted in the reduction of forested areas, and led to a deep ecological crisis due

to climatic rigors, deficits repeated rainfall and especially to inappropriate practices of natural resource management.

#### **4.6. Current forest areas with a management plan:**

In the ECOWAS total 11.325 million ha of forests are subject to a management plan or management averaging 11.3% of the forest area of the sub region (FAO 2012). Given the very limited data available, it is extremely difficult to predict the trend in sustainable development. Partial data collected in the context of the Global Forest Resources Assessment 2010 FAO (FAO, 2010) indicate that the proportion of forests under management plans is very low, without specifying:

- ✓ If management plans have been developed taking into account all aspects of sustainability;
- ✓ And, in the case where such plans exist, their effective application rate.

In general the development of management plans for forests following standards taught at universities and forestry training schools. In recent years it has been noted in the sub-region an evolution of management plans taking into account more of the social dimension, including the organization of local communities in forest formations and their involvement in resource management. These plans called participatory arrangements are a recent experience in the decentralized management of forest resources. Their implementation remains problematic, especially at the end of the projects that have initiated.

In the absence of data in reports provided by countries, those of the FRA 2010 report have been used to illustrate the level of effort made by the countries of the region regarding sustainable management of forest resources through their development.

The table below shows the situation by country. It shows that it is Nigeria who leads with 41% of managed forest area. It is followed by Benin, which, always in relative terms, shows that 38% of the forest area has a management plan.

However, there's a difference between the availability of the management plan and its implementation. For example for Benin, as evidenced by the experience of the PAMF project with local management structures (SLG) in place that worked well with management and resources of the project but since its closure in 2007, they seem to have come into lethargy and implementation of compromised management Plans.

Apart from Togo whose data is not available, it is Sierra Leone (3%) and Mali (5%) who hold the lowest rates of areas with a management plan.

**Table 11:** Forests have a management plan within the ECOWAS

Country	Forests subject of Landscaping Plans	
	Area in X 1000 hectares	% Of forest area
Benin	1 741	38
Burkina Faso	600	11
Cape Verde		
Ivory Coast	2 087	20
Gambia	75	16
Ghana	971	20
Guinea	322	5
Guinea Bissau	150	7
Liberia	265	6
Mali	589	5
Niger	220	18
Nigeria	3 730	41
Senegal	500	6
Sierra Leone	75	3

Country	Forests subject of Landscaping Plans	
	Area in X 1000 hectares	% Of forest area
Togo		
<b>Total/Average</b>	<b>11 325</b>	<b>11,3</b>

*Source: FRA 2010*

#### **4.7. The annual timber production and forest productivity:**

In the absence of harmonized data provided by the country reports, the FRA report data were used to analyze the wood production in the region. The following table shows the breakdown between countries. Thus, the average annual timber production in the ECOWAS countries for 1990, 2000 and 2005 amounted to 18,554,000 m<sup>3</sup> Industrial wood and 157,175,000 m<sup>3</sup> for firewood.

Overall the total output of industrial round wood is experiencing a gradual upward trend in all ECOWAS countries except Ivory Coast, Guinea Bissau, Liberia, and Togo. The countries with the lowest production are Burkina Faso, Cape Verde and Senegal. The production of industrial wood in the order remains dominated by Nigeria, Togo, Ivory Coast and Ghana. Industrial wood is often for export with a share of somewhat weak domestic consumption by countries.

As for firewood, the same trends are observed for all ECOWAS countries. The largest producers of fuel wood remain in sequence Nigeria (65,898,000 m<sup>3</sup>), Ghana, Guinea, Ivory Coast, Burkina Faso, Sierra Leone, and Senegal. Guinea-Bissau, the Gambia and Cape Verde have the lowest production. Energy wood production remains highly correlated with energy wood consumption, therefore the demographic weight of countries. It should be emphasized that the ECOWAS countries depend on average between 70 and 80% forest resources to satisfy their need for cooking energy. This logging is one of the causes of degradation of forest resources especially combined with agricultural clearing and bush fires. In addition as shown in Table above, logging is often made in the undeveloped heavy and does not respect the sustainable management standards.

**Table 12:** Annual timber production at the ECOWAS countries

Country	Industrial round wood (volumeX1000m3)			Firewood (volumeX1000m3)		
	1990	2000	2005	1990	2000	2005
<b>Benin</b>	317	380	404	6 396	4 132	4 284
<b>Burkina Faso</b>	3	5	5	6 336	7 243	7 333
<b>Cape Verde</b>						
<b>Ivory Coast</b>		2 282	2 175	8 826	9 855	10 004
<b>Gambia</b>	80	130	130	522	653	744
<b>Ghana</b>	1 382	1 298	1 508	14 833	23 780	23 780
<b>Guinea</b>	626	748	749	10 787	12 431	13 441
<b>Guinea Bissau</b>	20	7	7	22	33	35
<b>Liberia</b>	609	856	370	3 843	5 226	6 678
<b>Mali</b>	402	473	474	4 559	5 439	5 778
<b>Niger</b>	454	579	701	9 089	11 572	14 023
<b>Nigeria</b>	9 321	10 831	10 831	59 095	68 172	70 427
<b>Senegal</b>	8	15	43	4 687	5 115	5 276
<b>Sierra Leone</b>	152	142	142	8 383	6 070	6 242
<b>Togo</b>		3 684	3 320		3 370	3 012
<b>Total</b>	13 374	21 430	20 859	137 378	163 091	171 057
<b>Annual average</b>	<b>18 554</b>			<b>157 175</b>		

*Sources FAO FRA 2010*

Regarding the productivity of forest stands, the data provided in the country reports show a variation according to forest strata and climate areas. In Mali, according to the work done by the Project Inventory of Land Resources (PIRT 1979 - 1982) and Woody Resources Inventory Project (PIRL 1985-1991), annual increases of 0.3 to 0.4 m<sup>3</sup> / ha / year in the Sahel, of 0.54 to 1 m<sup>3</sup> / ha / year in the Sudan zones, 1-2 m<sup>3</sup> / ha / year in Guinean zones were obtained.

In Guinea, it varies by forest layer: woodland (1-2 m<sup>3</sup> / ha / year), mangroves (5-8 m<sup>3</sup> / ha / year), woodland (2-3 m<sup>3</sup> / ha / year), dense forest wet (2 to 6 m<sup>3</sup> / ha / year).

In Senegal, according to the merciful work (1982) productivity was estimated based on the rainfall in the area. Thus, between 900 and 1000 mm of rainfall, it ranges from 0.8 to 1.2 m<sup>3</sup> / ha / year; and between 600-800 mm rainfall, it varies from 0.16 to 0.24 m<sup>3</sup> / ha / year.

In Niger, the Project PUSF (1986) estimated the average increase to 0.5 cubic meter / ha / year for forest Combretaceae production of wood energy. In fact, this productivity is highly variable 0.5 to 1 cubic meter / ha / year depending on the site, depending on the coverage and the species that dominates the stratum. Research by INRAN (2003, 2004, 2005, 2006) under the NFAP allowed going further and giving more precision in determining the productivity of forest formations according to strata. This work also gave the characterization of different forest formations depending on climatic, geological and geomorphological conditions in which they operate. The increases obtained range from 1 to 1.5 cubic meter / ha / year depending on the types of forestry training (linear and mixed bush, savannah, bushland).

Data on the productivity of forest formations have not been provided in most country reports. Generally these are often not available due to the scarcity of studies on the evaluation of forest productivity.

Those available were often made in the ancient part of studies conducted in some countries with the assistance of technical development partners (FAO, World Bank, etc.). In general, productivity per hectare reported in the literature and in the development of many development plans is based on the work of Clement (1982) with the incoming data rainfall and ground projection of crowns of the upper stratum. The data are obtained in most cases by comparing the volumes collected between two clear-cuts. This method is a practical simplification because not taking into account different parameters affecting the productivity of forest stands.

This constitutes a major constraint holding account of the importance of this variable for the sustainable management of forest resources. To overcome this deficiency, most existing development plans in the area put up with the extrapolation of these very old data. In addition, the comparison of data between countries is all the more difficult they are sometimes attached to the eco-geographical zone (Sahelian, Sudanian etc.) sometimes to forest strata or types of forests (dense forests, woodlands, etc.).

#### **4.8. Actors and different forest resources marketing channels:**

Through the branches of forest products, several actors are involved whose roles, responsibilities, interests and motivations differ. Next the products concerned, those involved in marketing may differ. We can note four major product categories: Timber and service wood heaters and charcoal, non-timber forest products and hunting products. In different countries, sectors are individualized for these are different types of forest products. We will particularly

emphasize in this study on the timber and service wood and energy. For both products, sectors are still dominated in the various countries by an informal sector except for export and import both timbers.

In terms of individual segments (production, processing, transport, trade), key players have been identified.

- **The actors in the production:**

At the production of wood products, the main actor is the state that in most of the country has access rights to the resource. Other key actors are local authorities; landowners, loggers and field edge traders.

**The State:** In most countries, the state, through the Ministry of Water and Forests and Waters and Forests Branch administers access and exploitation of forest resources. It defines forest policy and ensures the application of forestry law. Status of forests mainly consist of reserves and classified forests directly administered by the department of Water and Forests, unclassified forests or forest land whose access is free and private forests belonging to third parties. Depending on the country, there is a greater or lesser degree of decentralization of forest resources. In countries where management is highly centralized (rather weak decentralization policy in Ghana, Gambia, Sierra Leone etc.), the state gives the right of access to the resource, but village leaders benefiting from recognition of legitimacy on local forest resources and lands play an equally important role in access to the resource. This causes the same holder of the operating permit issued by the state, foresters almost always manage to keep pace with the leaders Customary. At the operating state often levies taxes that may be levied based on products or exploited surfaces. It controls logging and managed litigation with loggers offender.

In countries where decentralization is more or less advanced (Senegal Burkina Faso, Niger, Mali), local authorities play a larger role.

**Local authorities:**

In countries such as Benin, Burkina Faso, Mali, Niger and Senegal, the decentralization policy conferred powers to the municipalities for sustainable forest resource management. This makes access to the resource allowed by local elected representatives and their conferring a means to better control the activities of logging companies. Also in the exercise of its powers, it has been established in many countries local management structures that are often inter animated by the

local village committees local populations of exploited forests. These committees were created under the supervision of improvement projects and the management of forest resources. This organizational change was accompanied by a revision of forest taxation with the institution of forest revenue distribution formulas to benefit local communities and village management committees. The major challenge of this development often lies in the sustainability of established arrangements and the transparent and effective management of funds generated by forests.

### **Landowners:**

In some countries such as Benin and Sierra Leone, the landowners, as well as the state and local communities, play a very important role in farmers' access to forest resources. Thus, Sierra Leone, anyone who wishes to use trees for firewood or charcoal must first obtain permission from the owner of the land and local tribal chief, or forest district officer if the exploited trees are located in forest reserves. Now forest governance in this country involves Forest Service and local councilors who receive both incomes from logging.

In Benin, the compensation paid to landowners by operators is symbolic. Therefore, the economic importance of these homeowners is currently low in the wood energy sectors. This situation is not conducive to empowerment of local populations in the management of the resource. However, it was reported that some owners are beginning to refuse access to their forests to outside operators. Currently the forest management plans give a greater share in the distribution keys to landowners in the implementation of these plans.

### **Loggers:**

There is a difference between lumber loggers and fuel wood. For timber, operations are made by more or less informal businesses are sawmills in which the state gives annually operating permits or concessions by country. These mills use personnel for forestry (woodcutters) and sawing wood. These are often companies working with obsolete equipment with low yields greatly encouraging the waste of forest resources.

For the exploitation of charcoal, loggers own the die.

In Guinea Bissau, the exploitation of wood energy is still in the informal stage with a large number of producers, who operate in the dry season and are engaged in agriculture during the rainy season. Geographical diversity and unpredictability of their decision to operate and the

small quantities produced by each of them, make wood energy production a highly fragmented activity and virtually uncontrollable.

In Senegal, these operators called "sourghas" often come from Guinea Conakry and are relatively better controlled through their filing system through loggers organizations (cooperatives and companies). Parallel to this category of operators, we note the emergence of local producers from the neighboring villages of forests, with the participatory management of forest resources.

Sometimes these loggers have a more commercial profile of timber since they are purchasing the product from loggers that can be free or affiliated to them (Senegal) before transporting the products to consumption centers.

In Benin, the organization for the production of charcoal is quite similar with Senegal. Indeed, loggers are professional wood energy preferably exercising their activity in forested areas (Department Collines, Zou (Djidja) and to Kétou, Bassila, Tchaourou, etc.). They organize coal production (they install charcoal teams on logging sites) and organize the evacuation and marketing to Cotonou. Some women come to buy the products in trucks or Titans and convey them to the major consumption centers.

It should be noted that the benefits of such exploitation are very low (very little income distributed locally, except cargo handling). For the forester, the main advantages of this method of organization are (i) it is safe to coal quality product, which allows it to negotiate a better sales price in Cotonou, (ii) it is a master of manufacturing delays, which ensures a faster turnaround on investment and minimizes risk, (iii) avoids problems with local people (problems faced by wholesale traders, such as non-compliance with deadlines and the diversion of loans granted). The main constraints of this organization are: (i) the material needs of pre-financing of projects, (ii) the problems of negotiations with landowners and the newly installed municipalities.

In Mali we distinguish primary sales in rural areas between the operator (woodcutter) and an intermediate which is mostly a trader - carrier.

- **The actors in the transformation:**

Concerning the wood energy sector is generally often foreign lands to loggers who engage simultaneously for cutting and charring wood for charcoal production. Having practiced carbonization very long time, they have capitalized some experience in this field and mostly

use traditional carbonization techniques with very low yields (15-20%), contributing to forest degradation.

In Benin, in the central part of the country forest (Bassila Commons, Djougou, Parakou, Tchaourou), the dynamics of carbonization is maintained by the clearing of forest areas for agricultural production (yam and maize). The activity is mainly carried out by immigrants and by local farmers. Similarly in Senegal, agricultural clearing is often a pretext for carbonization of wood resources.

With the advent of forest management, local people are organized in coal producer groups. These are most often formed on modern carbonization techniques including the grinding wheel Casamance (Senegal, Benin), which produces much higher yields (30-35%), contributing to the preservation of forest resources.

In Togo, exclusively farmers provided women wood energy production in this case. As for firewood, two main actors were involved in the production of charcoal: ODEF that provide 0.5% of the market with improved stoves and peasants, 99.5%. For reasons of economic efficiency since 2005, ODEF made the deck leaving farmers ensure 100% production.

In Senegal, the government has mandated the use of the Casamance kiln instead of the traditional wheel. This has trouble being respected because the loggers are not motivated to acquire the necessary equipment (fireplaces) for making the Casamance kiln. Training is also required to adopt this technology.



**Photo 1:** Casamance grinding wheels and traditional grinding wheels in Senegal

Carbonization techniques used in the region have low yields in general. Improvement through the introduction of more efficient technologies would be of great help to streamline levies on forest resources. Their introduction would also have to limit emissions of greenhouse gases. However, their introduction could facilitate that supports multiple aspects related to the

adoption of these technologies. This is the induced extra cost, the necessary capacity building, awareness on the added value of their use, and institutional measures that are often overlooked but very important for their adoption such as the level and plates of forest royalties.

For lumber, logs are usually transported at sawmills or they are transformed. Given the low level of equipment of the mills, processing is often primary and undiversified (plates, trays) and the very low level of performance.

- **The transport actors:**

The transport of wood and charcoal production areas to consumption centers are often provided in the region dilapidated trucks often. In Mali, for example wood energy transport regulated with green trucks. The carrier is a key player in the energy wood sector in different countries. Wood energy is a consumer product in the cities and villages; almost all means are used to transport the place of production to places of consumption. On shorter distances, people use the cart, bicycles and motorcycles, porting etc.

In Benin, women often perform fuel wood harvesting, in the dry season. The wood is harvested and transported to head to stores roadside or track. If the operating area is very remote, it is often young people who collect and transport the wooden cart or motorcycle until roadside. The exploitation of wood is usually conducted by indigenous, except north of Kandi or she is frequently conducted with genuine lumberjacks from Niger.

To escape the control of the Forest Service, traders can use back doors (refrigerated trucks, hay trucks, etc.). Often transportation is the most master station in the wood energy sector, given the constraints of the service (remoteness and bad roads in production areas, control of law enforcement, long distances between the center of production and consumption, time very long wait at the loading and unloading etc.). Therefore carriers simultaneously play an important role in the distribution of the product (they are often held by wholesalers or retail outlets) and financing of the sector by providing credit to the operator on transport to alleviate the need for funding of the latter.



*Photo 2: Timber transport in Togo*

- **The actors of trade:**

In general marketing of wood energy follows different circuits depending on either fuel wood or charcoal:

- **Firewood:**

In Mali, for example, wood is transported in town is sold wholesale or retail. Wholesale can be performed directly by the carrier to the consumer or to a custodian wholesaler or retailer who has sales points in markets or on the streets of the neighborhoods of the city.

In Benin, fuel wood wholesalers don't pre-finance production. They buy wood already operated, organize, as appropriate, its rally on accessible areas and transport to point of sale. Resale is often directly at retail.

The main difficulty met by the meetings fire wood traders, whatever the city is the flow problem of wood. Their main customers are traders or artisans, households consuming less and less wood. The flow time of a truck loading range from one (1) to five (5) months.

In Guinea Bissau, firewood is mostly used with a greater consumption in rural areas. Note that the charcoal consumption in Bissau takes larger dimensions.

- **Charcoal:**

In Benin carriers are professional wholesaler of wood energy that pre-finance the carbonization activity by making advances to local populations. They follow the progress of production and

organize the evacuation and transportation to Cotonou and Porto Novo. Their relationships with local producers are organized through intermediaries that distribute advances, monitor the progress and act as arbitrators in conflicts. Resale is wholesale, wholesalers or retailers. Retail trade of coal and firewood is almost exclusively female activity. Schematically, we can distinguish: (i) professional detailing, which have a place in the market and making it a core business; (ii) detailing that could be described as "opportunistic", which sell most often at home, and for whom this represents an extra income.

In addition, other intermediaries may be interspersed in the marketing chain by taking their margin. These include, among others: (i) wholesalers settled in the city, who buy bags of charcoal carriers wholesalers and sell to retailers, (ii) sellers roadside who buy small carriers or producers and s' settle on easily accessible outlets. They sell mostly to individuals or casual traders.

In Senegal, an intermediary between the wholesaler and the retailer operator named "coxeur" dominates the commercialization of Charcoal in big cities. The organization of the distribution of charcoal based mainly on public roads called on coal parks spaces. The majority of products arriving at the Central Park are vented to these outlets. There are still a number of "touts" who take care of cargo arriving at the central park in Bargny. Given that carriers are looking to sell the "touts" creditworthy, the market is dominated by a number of "touts". [45] Once they are supplied by "touts," retailers are paying the product delivered either in cash or within an agreed period. In many cases, the retailer works for the "coxeur" which owns a coal deposit of retail.

#### ■ **Pricing structure of the firewood industry:**

Several factors contribute to the price structure of charcoal and firewood in the region.

In Benin, for example, observed in the sector that prices vary depending on: (i) coal quality, (ii) the size of the lumps of coal, (iii) the type of species used; (iv) carbonizing techniques;

Changes in the price of wood energy are mainly determined by the availability of agricultural labor. We can distinguish four (4) phases.

- During the rainy season (June to October) coal production is at its lowest. Prices are at the highest level from July to late October. 35 kg bag sells for **3000-3500 FCFA in Cotonou;**
- - In November, the rains cease, coal production and prices fall again;

- - From December to late March: the dry season and the end of the harvest (especially cotton). The bag of charcoal sells 2700-2900 CFA;
- - From April to May, the end of the dry season, the agricultural work hand turns to coal production, prices fall further. The bag of charcoal sells 2600-2800 CFA.

It can be assumed an average deviation of about 20% to 25% of the price of coal consumption between the rainy season (July to October) and dry season (November to June). The wholesale coal prices in Cotonou therefore oscillates between 75 CFA / kg and 100 CFA / kg.

In Guinea, there are no analytical data of sales in the sector business. Today, only the price to consumers is knowable which varies according to the area (the pile of fagots and kilogram of charcoal contain a different prefecture, sub-prefecture to another).

Yet the studies in 1998 reported that the weight of the coal industry which supply the city of Conakry is very important if we consider an average price of 140 GNF kg and the annual consumption of 90,000 tons, the total turnover the sector is 12 billion GNF which almost 50% is the gross margin of the activities of wholesalers and retailers. In Conakry, the supply of traditional energy mobilizes to varying degrees about 30 000 people and the sector's turnover for 1995 is estimated at nearly 30 billion GNF.

In Guinea Bissau, the exploitation of energy wood is a hybrid economic sector where sales prices and costs at various stages of getting goods are not expressed in monetary terms according to the rules of accounting company, but rather by reference á psychological and incidentally given to a cost of production or sale of food for survival.

The only noticeable factors as influencing the prices are seasonal fluctuations: the rainy season when offered scarcity effect decreases and causes higher prices and dry season when the staff offered and prices downward trend.

In reality, there is rather a certain dualism in the general arrangement of prices or costs, but include, based on discussion results with some traders, the following prize structure:

- Production costs;
- Transportation costs;
- Margins for commercial intermediaries;
- The margins of wholesalers;
- The retailers' margins;

- Forest tax;
- Consumer prices.

It is important to note that the lack of institutionalized sector organization does not favor the establishment of a price structure approved, as is the case in the oil sector.

The observation can estimate that the winner is the best wholesaler and unless the winner is the owner of the resource, followed by the State whose revenues are often ignored or diverted from its destination.

In Togo, wood energy has considerable economic importance. According to the report Energy Policy (2011) Togo "The volumes sold charcoal and firewood can be estimated in 2010 at 74 billion FCFA / year, of which 59.5 billion FCFA / year to 420,000 t / year of charcoal (141,700 FCFA / t in Lomé); 14.5 billion FCFA / year to 690,000 t / year of wood fire (21,000 FCFA / t). The profit generated by this trade is estimated at 2.22 billion CFA francs / year "

According to the estimate of ProDRA component 3 (2014) a prudent overall assessment of total annual trade of wood energy business (excluding rural domestic consumption) is about 193.5 billion CFA francs.

The bag of charcoal "said 100 kg" which weighs about 35 kg is sold at Lomé between 15,000 and 18,000 CFA francs CFA franc. If the caution is retained by a price of 15,000 CFA franc piece we arrive at an average price per ton of coal 428 751 CFA francs / ton. To 420,000 tons of coal sold in urban areas (80% in Lomé) we arrive at a turnover of 178 976 million CFA francs or about 179 billion CFA francs. Firewood is sold in town 14.5 billion FCFA / year to 690,000 t / year of wood fire (21,000 FCFA / t).

It is difficult to assess the number of wood energy business at regional level mainly to the fact that:

- Some country reports have not updated this part;
- The difficulty of rebuilding data given the unavailability of data on supply that is rather assessed on the basis of forest area while the estimated consumption does not often give national averages etc.

#### **4.9. Harmonizing methods and evaluation of forest policies in the region:**

Despite differences over methods and approaches, forest assessment methods harmonization initiatives have been taken in the sub-region especially in the area of the nomenclature of the classification of forest strata. Thus, FAO has implemented a harmonized classification covering all the countries of the sub region, as well as the Rapid Land Cover Mapping Project with the USGS EROS.

Regarding forest inventory methods, like what is done in Senegal with the SIEF, other countries have also begun to develop their forestry information system (SIFOR, Mali, SIEF in Benin). Likewise, following the recommendations of the Niamey workshop, 2004 the capitalization of the Sahelian experience in management of natural forests for production of wood energy, a sharing meeting on inventory and forest management practices which simplified grouping all ECOWAS countries, was held at Forest Practice training center (CFPF) of Tabacoro in Mali as part of domestic Energies Promotion Regional Program and Alternatives in the Sahel (PREDAS) CILSS.

### **Recommendations:**

To deal with forest degradation, a vital part in the economy of the various countries of ECOWAS, States must:

1. Strengthen the policy of decentralization of forest management which is underway in most countries of space;
2. Promoting participatory and integrated management of forest stands for sustainable management of forest resources in the sub-region;
3. To harmonize the technical methods and mapping and forest resources assessment (mapping, forest inventory);
4. Arrange the forest products industries through a professionalization of actors;
5. Promote private plantations through an incentive for economic operators to invest in the sector with attractive conditions.

### **Conclusion:**

Forests in the ECOWAS (74.3 million ha) are in a very degraded state due to many causes by natural and anthropogenic factors. Indeed, the annual deforestation levels during the period

2000-2005 was estimated at about 899,000 ha of forest is a current rate of loss of 1.2% (FAO, FRA 2005).

Furthermore, the methods for evaluating these resources vary from one country to another and sometimes even within the same country. Thus the forest data available are often not very accurate especially regarding the estimated forest area but also stand dynamics, essential elements in the forest management planning.

On the logging plan, we see in almost all countries of the space a lack of organization of the different production sectors (timber, fuel wood, non-timber forest products, etc.) resulting in non-professional actors. And to ensure sustainable management of forest formations in the sub-region, it is certainly important to harmonize approaches and policies, as it is raised in the previous chapter, but it is also essential to review and improve techniques and methods of intervention to better control potential but also the dynamics of forest stands. This will allow better planning of forest management through participatory and integrated management.

## CHAPTER V: THE ENERGY RESOURCES OF BIOMASS

### 5.1. Importance of wood energy in the final energy report in the region :

In all ECOWAS countries wood fuels represent 80-95 % of the domestic energy used by households to satisfy their needs. In 2006, FAO estimated wood fuel production to 171 091 000 m<sup>3</sup>. It is likely that wood will continue to be a major energy source in Africa in the coming decades given the low incomes of households and modest investment in favor of substitutes (FAO, 2008). The forecasts point to a 34% increase in fuel wood consumption between 2000 and 2020.

**Table 13:** Fuel used for cooking in the ECOWAS Member States (2010)

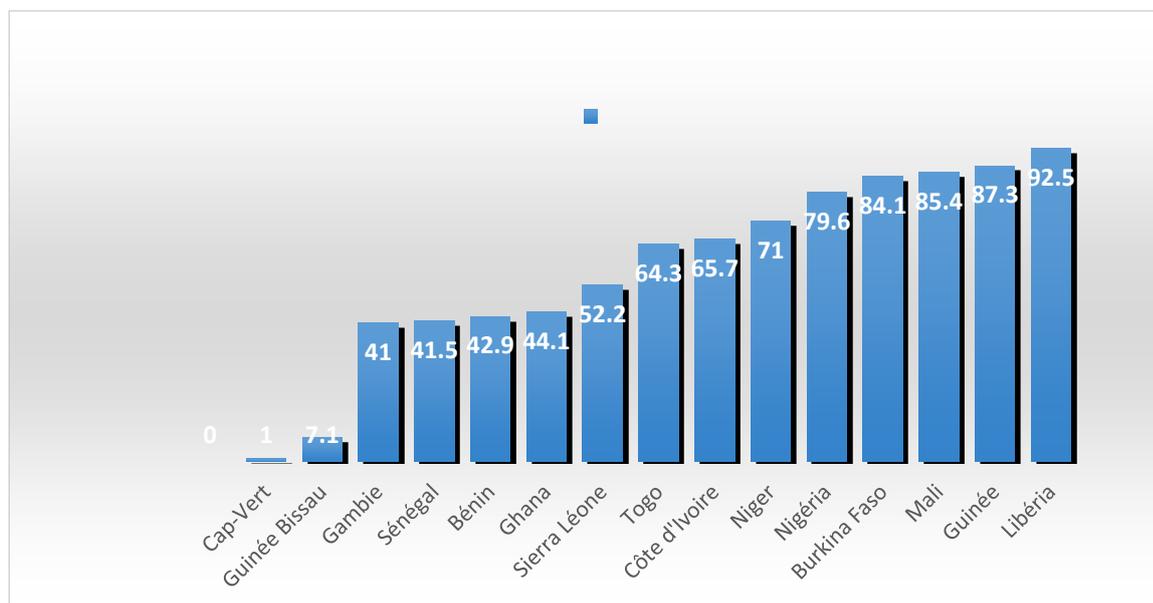
	Part of the population that uses solid fuel for cooking			Fuel used for cooking in percentages of the population							
	TOTAL	URBAN ZONE %	RURAL ZONE	WOOD	MAN-URE	WOOD COAL	COAL %	PARAFINE OIL	GAS	ELEC-TRICITY	OTH-ERS %
Benin	94	87,7	97,2	72,2	0	21,1	0	1,9	3,7	0	1
Burkina Faso	95	81,8	99,2	88,5	0	4,3	0	0,4	6,3	0,1	0,4
Cape Verde	31	11,9	72,5	35,1	0	0	0	0	62,5	0	2,4
Côte d'Ivoire	79	64,2	> 95	66,3	0	19,6	0	0	13,7	0,1	0,3
Gambia	95	91,1	> 95	78	0	12,8	0,1	0,2	4,6	0,1	4,2
Ghana	84	74,3	> 95	50,8	0	34,8	0	0,6	10,4	0,1	3,3
Guinea	96	> 95	> 95	76	0	23	0	0,2	0,1	0,3	0,3
Guinea Bissau	98	> 95	> 95	69	0	29,3	0	0	0,6	0,6	0,5

Liberia	98	> 95	> 95	58,9	0	40,5	0	0	0	0	0,6
Mali	98	> 95	> 95	82,6	2	14,5	0	0	0,2	0	0,7
Niger	94	> 95	> 95	94,2	2	2,8	0	0	0,7	0,2	0,1
Nigeria	75	40,4	91,6	72,3	0,5	2,2	0,1	23	1	0,3	0,6
Senegal	56	17,4	85,9	47,7	0,6	7,8	0	0	41,1	0	2,8
Sierra Leone	98	> 95	> 95	85,2	0	13,8	0	0,7	0,1	0	0,2
Togo	95	> 95	> 95	54	0	43,8	0	0,5	1,2	0,1	0,4

Worldwide, 78% of people using solid fuels for cooking live in rural area. This trend is true for the ECOWAS region, since in individual Member States, the share of people using solid fuels in rural areas equals or even exceeds that of people in urban areas. It is also true that most urban dwellers depend on solid fuels, which became the primary source of energy for cooking in urban areas for all Member States with the exception of Cape Verde, Nigeria and Senegal. In the entire ECOWAS region, wood represents the main cooking fuel and then wood charcoal. The most used technologies by people dependent on wood continue to be the traditional fire "three stones" or any conventional furnace, while the majority of those dependent on charcoal employ metal and traditional charcoal stoves.

The energy-efficient cookers as well as gas and electricity are all options that could expand access to environmentally friendly cooking fuel. They can reduce or even negate the environmental and social costs caused by dependence on traditional biomass.

The total final energy consumption in the ECOWAS region has reached about 5687 petajoules in 2010, representing nearly 35% of total Sub-Saharan. The resources of traditional biomass such as wood and charcoal, play a central role in meeting the energy needs of the entire region. In 2010 traditional biomass has indeed provided more than half of the total final energy consumption of nine members States (see graph). These are households that are most dependent on these resources. In Gambia, for example, the International Agency for Renewable Energies (IRENA) estimates that traditional biomass supports 90% of domestic energy consumption and even 97% in some rural areas. In Ivory Coast, wood and charcoal support about 70% of the energy consumption of ménages<sup>24</sup>.



**Figure 12:** Share of traditional biomass in the total final energy consumption (2010).

### **5.2. Analysis of the energy wood supply for the forest potential of the region:**

The exploitation of forests to meet the cooking energy needs is not always done sustainably. Benin has evaluated the sustainable supply of wood fuel to be in 2010 of 4,466,000 tons while in 2015 it would represent 4.213 million tons, while its consumption was estimated at 5.932 million tons, or a gap of 1.719 million tons. This situation is very common in the countries of the ECOWAS region particularly in the Sahelian countries.

The supply within a country is not uniform and the supply pattern is influenced by two factors:

- The consumer division consists of the urban center characterized by strong demand and increasing urbanization;
- The supply basin formed by the region that contains the exploited forest resources;
- The distance between these two poles.

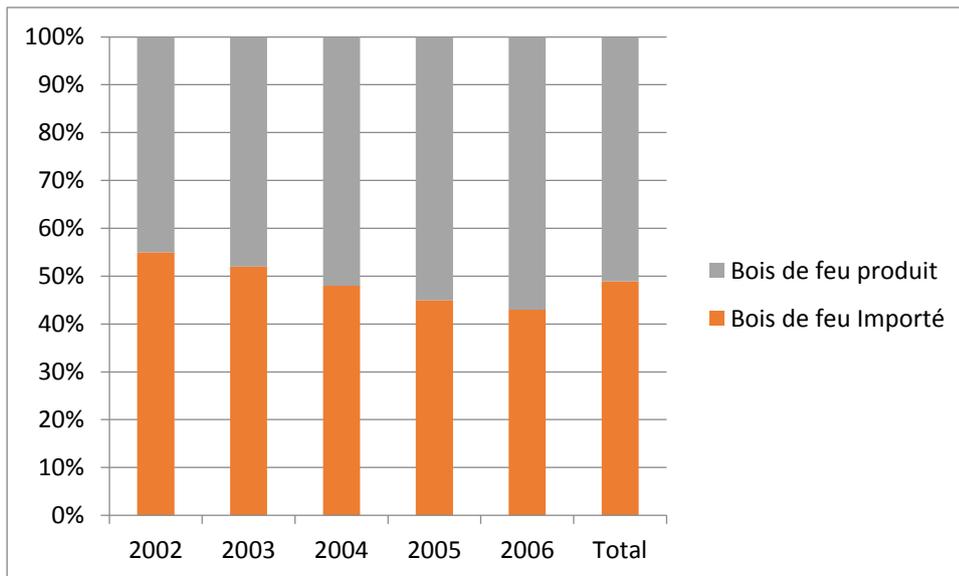
These are the closest resource basins of consumption centers that are first mobilized to meet demand. Indeed, these ponds have a secure income given the low transportation costs compared to the more remote basins of the consumer center to supply.

That is why there is often overexploitation of the closest basins consumption centers. It is this phenomenon that has maintained the coalface operating in Senegal that moved from west to east.

For example, in Benin, the supply situation of wood resources varies from one region to another. While the Centre and part of the northern countries are still relatively self-sufficient, imbalances have long since emerged in southern regions. Strong pressure is then exerted on the resources available to the Centre and North of the country to supply the large southern urban centers. Note that the series of data from 1996 to 2015, potential supply firewood of Benin is steadily declining.

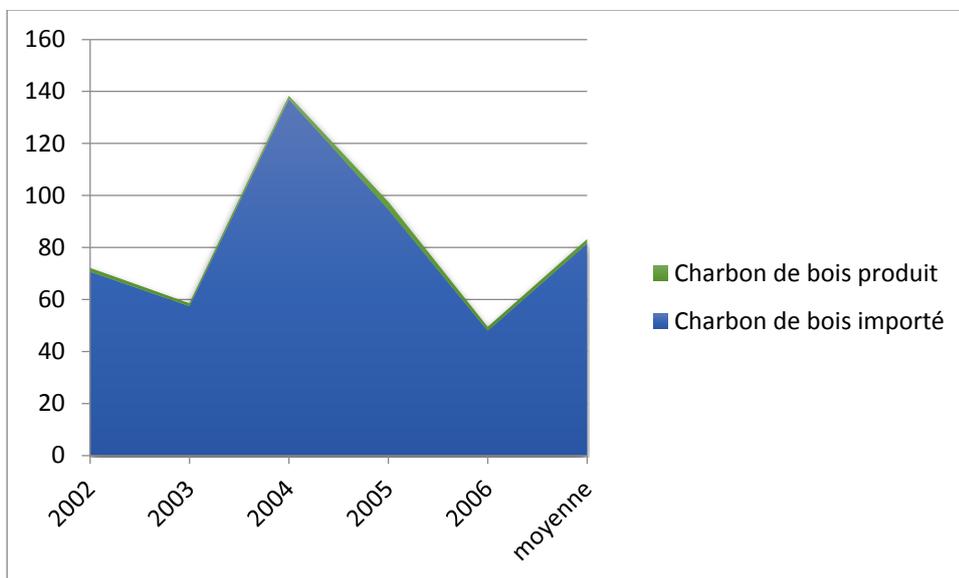
In Ivory Coast, firewood production is difficult to assess. However, it is estimated that firewood represents 80-90% of the total wood consumption. The production of fuel wood was estimated in 1995 to 14 million m<sup>3</sup>. In 2020 it is estimated that the country will experience a shortage of firewood that could well be offset by other fuels, including oil, butane gas and electricity. (FAO, 2000 Prospective study of the forestry sector in Africa, Ivory Coast).

The supply demand analysis of wood energy intra-country shows that in the ECOWAS region, despite the existence of deficient regions fuel wood within countries, supply is ensured by a transport of fuel wood between regions. The region is still self-sufficient in energy wood and exchanges between countries of fuel wood are almost nonexistent. It is only in the Gambia that we noted a massive importation of firewood and charcoal from Senegal. Indeed, Gambia only allows the cutting of dead trees for firewood. In 1980, the country banned the production of charcoal. Therefore, the charcoal used in the country is either imported from Senegal or produced fraudulently.



**Figure 13:** The percentages of firewood imported and locally produced

Between 2002 and 2006 , the annual average amount of firewood stored for consumption is 17,882 m3 with a sawtooth pattern . On average, 49% of this wood comes from Senegal.(national report)



**Figure 14:** Evolution of the number of bags of charcoal and imported products in Gambia

Between 2002 and 2006, The Gambia has imported an annual average of 81,512 bags of charcoal wood representing an average annual consumption of 4,076 tons.

The trend of supply of firewood and charcoal in the Gambia from 2002 to 2006 clearly shows a decrease in the consumption of firewood while the charcoal increases. The reason could be that the use of charcoal is widely preferred by mostly urban populations and is considered a cleaner fuel than wood.

However this poses a problem of sustainability because the fraudulent cross-border operations between the two countries are of increasing concern and drew the attention of authorities. If effective measures to curb this scourge were taken, it would be difficult for people who currently cook with coal to go back to fuel wood and this could create a fraudulent operation right inside The Gambia.

Guinea remains in surplus in wood energy. The annual available supply of firewood is 13.3 million m<sup>3</sup> and consumption (demand) is estimated at about 9.7 million m<sup>3</sup>.

But this favorable national situation hides sub-national specificities with situations of local wood energy crisis, resulting in environmental degradation and enormous difficulties for people in these areas.

According to RPTES report, these crisis areas are:

- The Maritime Guinea where biomass inventory made in 1992 to the prefectures supplying Conakry spring a deficit of about 200 000 tons for the whole area, or 20% of total consumption in that area. According to the same study, the deficit could increase considerably over the years. Also, mangrove areas are under severe pressure due to crafts salt extraction of fish smoking.
- The suburban areas of cities across the Guinea where uncontrolled pressure for fire wood supply highly degraded forest areas concerned; <sup>3</sup>
- The Sudanese part of Upper Guinea;

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<sup>3</sup> If the bag is evaluated at 50 kg of coal of wood

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- The regions of Guinea (Maritime Guinea and Forest Guinea) that flowed refugees from Liberia and Sierra Leone, the number could be estimated at over 700,000.

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In general, energy wood supply in the various ECOWAS countries is mainly from natural forests, fallow and private plantations (to a lesser extent). The exploitable potential varies by country and type of beds within the same country and the types of strata within the same forest. There is also, especially in countries with significant forest potential, use of by-products from sawmills and wood industry in energy (Ghana, Ivory Coast etc.). Also initiatives have been developed for the recovery of plants such as cattail cooking energy. We must recognize that these experiences do not have a scale to reverse the downward trend of production potential of wood energy in ECOWAS countries. The factors influencing this trend of wood energy supply are: land clearing, recurrent and severe bushfires, drought, transhumance, etc.

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### **5.3. Analysis of the demand for wood energy:**

The ECOWAS countries all have an energy profile marked by the preponderance of biomass in their energy balance. Indeed, these countries still depend largely on the forest to cook their food, warm, iron their clothes, and anoint their habitats etc. Over the years, the amount of wood and charcoal consumed increases under the influence of factors such as:

- **The demographic beliefs:** The 15 ECOWAS member states offer various demographic, socioeconomic and social contexts, each of them having an impact on the supply and demand for energy in the region. With just over 334.6 million people ECOWAS region represents almost one third of the sub-Saharan population. Three Member States (Ivory Coast, Ghana and Nigeria) receive almost two thirds (67.5%) of the regional population. By 2050, Nigeria should access the third most populous country in the world behind India and China while Niger is already the world leader for its fertility rate (7.67). The average population growth rate in the region is of 2.5%, regional economic growth progressing strongly, increasing demand for energy and other resources will be posing new challenges in the coming decades. This situation makes even more urgent the need to improve energy efficiency and deploy solutions using

renewable energy (ECREEE, 2014 Progress Report on renewable energy and energy efficiency of ECOWAS)

- **The rate of urbanization:** the consumption of wood energy is highly sensitive to urbanization. Indeed, in urban and urban areas, people prefer to use charcoal instead of fuel wood in more rural areas. Given the still low yields char wheels used in the ECOWAS region, urbanization is an increased consumption of wood energy factor. With an average annual rate of urbanization for 2010-2015 by almost 4%, Member States of ECOWAS will experience new rural migration to cities promising economic opportunities. In 2011 43% of the ECOWAS population lived in urban areas although this figure varied considerably across countries ranging from 17.8% in Niger to 62.6% for Cape Verde. In Burkina Faso urbanization is particularly rapid (6% per year) while the great metropolis of Lagos (Nigeria) is one of the most extensive in the world.

- **Culinary practices subservient wood energy:** in the early promotion of butane gas in Senegal in 1974, the idea that the "rice prepared Butane gas is tasteless" was widespread. Similarly, Niger currently struggling to introduce the mineral charcoal as a cooking fuel. Although the worries brought on by alternative energy sources to wood and charcoal can be justified, there's often a hint "conservationist" on wood energy and culinary practices that accompany it.

- **Accessibility (availability, price, etc.) of wood energy:** wood is often the most accessible source of energy in terms of proximity, price, availability; ease of use etc. wood energy has strong advantages over other energy sources.

#### **5.4. Difficulties in energy supply from biomass and the measures taken to reverse the trend:**

Regionally as nationally, a clear diagnosis was made on the unsustainability of the current system of supply of wood energy ECOWAS region. Regional programs such as PREDAS, the United Nations initiative "Sustainable Energy for All", the White Paper ECOWAS-UEMOA, etc. have enabled a strategic analysis of the cooking energy sector both regionally and nationally. For example, during the development of the ECOWAS Policy on renewable energies, ECREEE identified several interrelated energy challenges in the region, including access to energy, energy security, impacts on human health and the environment and climate change.

Expanding access to modern energy services that include non-polluting cooking fuels and electricity is a first urgent priority for the ECOWAS region. The UN initiative "Sustainable Energy for All" reports that between 1990 and 2010, sub-Saharan Africa was the only region where the expansion of access to electricity and solid fuels was not slower than population growth.

In a more basic way, the tendency to break Supply/ Demand is inevitable if arduous policies are not taken to reverse the trend. That is why the regional and national level initiatives have been taken to better control energy cooking and modernization. The most commonly adopted solutions are: (i) promoting energy efficiency, wood energy substitution by alternative energy sources, (iii) the reform of institutional frameworks for access to the cooking energy clean.

### **5.5. Energy efficiency in the cooking energy sector:**

The ECOWAS countries recognize that the promotion of renewable energy and energy efficiency is an essential pillar for achieving the objectives of regional and national policies, hence the decision of the Heads of State of ECOWAS to create in 2007 , the Regional Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE). Currently, the main elements of an institutional framework in place to allow increased energy efficiency in West Africa. To accelerate progress in energy efficiency, a workshop was organized in Ouagadougou in April 2010 and brought together the highest levels of the directions of energy in the region. Based on this consensus, ECREEE formulated a program of work to prepare the ground with a large concrete effort to harness the potential of energy saving measures. ECREEE established a regional network of National Institutions and Focal Points on Energy Efficiency (INF). In cooperation with INF, ECREEE between October 2011 and March 2012, achieved area status missions in all countries of the region to assess the potential of energy efficiency measures and to determine the scope actions for energy efficiency.

In the field of cooking energy, ECOWAS countries have undertaken more or less considerable efforts to promote energy efficiency through the distribution of carbonization equipment and efficient cooking. These devices consist of the grinding wheels of efficient carbonization and improved households.

#### **5.5.1. The distribution of efficient carbonization wheels:**

Charcoal production is still given a rudimentary method of carbonization by incomplete combustion of wood through traditional grinding and pits. In the case of traditional wheel, that is the most used carbonization technique in the ECOWAS countries, the weight conversion

efficiency is low. It would be an average of about 15 to 18% depending on the various existing technical publications. The pits are the most inefficient devices and are very small (in Togo: 1 to 2 cubic meters of wood giving 1-4 charcoal 50 kg bags corresponding to approximately 40 kg actual coal, this weight varies greatly depending on species and degree of cooking).

The production of charcoal is one of the main reasons for deforestation and degradation of forestland in Togo. Woody biomass destroyed by this activity is about 2,799,759 tons per year.



**Figure 15:** Traditional pile of wood charcoal

In Benin, the Energy Information System has retained an average weight carbonization yield of 15%; which means it takes 6.7 kg of wood for the manufacture of one (1) kg of coal.

Internationally, the conversion factors used in the procedures (UN 1982, 1987 and 1991) are: for wood density of 725 kg / m<sup>3</sup>, the production of charcoal, 165 Kg / m<sup>3</sup> for a yield 16.5% of wheels used, or 6.06 Kg to 1 Kg of wood charcoal.

It would be possible to increase, to some extent, a better tracking performance for the carbonization process. Experiments conducted by the forest services in Benin through two projects (the Forest Plantation Project Fire, Food and Forestry Resources Bassila project) have resulted in yields of up to 20% from the improvement of the traditional method.

Compared to conventional grinding and pits with low yields, improved stoves built clay outperform. These furnaces are used in Benin, Ghana, Sierra Leone etc.

Considering the amount of wood processed into charcoal in West Africa, the carbonization yield is an important parameter for the conservation of forest resources. The production of charcoal maintains a greater pressure on the forests than the consumptions, even if its calorific value is greater than that of wood, non-efficient homes still widely used in the region do not allow enjoy this advantage. In this context, banning the production of charcoal is not possible, carbonization performance improvement was to occupy a decisive position in the strategies and clean the cooking programs and sustainable forest management.

It is in this sense that some countries have started to broadcast the Casamance kiln through participatory arrangements (Benin, Guinea, Senegal etc.). Casamance wheel has features that improve the carbonization process for the following reasons:

- Better ventilation of the control wheel or the oxidant (the vents can be opened or closed according to the different phases, according to the oxygen demands);
- Negative draft, (generated by the chimney) rapidly increases the temperature rise of the wheel to 500 ° C, which allows to go further in the process, carbonizing large-sized timber while shortening the ring;
- Recovery of pyrolignous acid and tar at the base of the chimney (see diagrams in Appendix);
- Better quality of the coal (higher fixed carbon content);
- Reducing the carbonization cycle (3 weeks instead of 1 month);
- Better yield by weight (25 to 30%) for the Casamance wheel while the performance of a traditional oven ranges from 18-23%. Meaning that with the amount of wood equivalent to 3 traditional ovens but charred by the "Casamance" method, we gain the production of a fourth wheel, which implies that generalizing this method could reduce the exploitation and deforestation of 25%;
- The preservation of the environment, the recovery of pyrolignous acids and tars that no longer percolate into the ground as they are recovered at the base of the chimney.

Senegal has now made compulsory by decree of the Minister of Environment and Sustainable Development using the Casamance kiln in operating sites of charcoal. However, despite this extent the use of traditional wheel remains for the following causes:

- The limited provision of coal to pay the fireplace which is the key equipment of the Casamance kiln and which costs 30,000 FCFA. With participatory arrangements, the PROGEDE2 supported local people trained in Casamance wheel to acquire fireplaces. As against the "sourga" forest operators and even less they are not motivated to acquire such equipment. Steps must be taken to encourage coal to acquire the fireplace;
  - The quantities authorized for the operation are denominated in coal quintal. Similarly, the fee payable is also sitting on the quintal of charcoal (700 CFA francs per quintal in developed area). These provisions do not encourage foresters to adopt efficient carbonization techniques because whatever the technique used, only the final product is recognized, while the use of the Casamance kiln is more demanding (purchasing fireplace, training);
  - The difficulty of monitoring compliance with this requirement in the field, given the limited number of forest officers. To cope, through local structures in forest management, it is now established local supervisors who ensure the respect of technical requirements and does not have the right to operate and is compensated for their engagement for the community. They play a bridging role for the agent for Water and Forests,
  - Manufacturing of fireplaces is artisanal, and depends on the availability drums are recycled.
- Performance tests carried out in Senegal on the Casamance wheel (PROGEDE, PERACOD) vary between 20 and 35% depending on the experience of the coal.

### **5.5.2. The promotion of efficient cooking equipment:**

With the consumption of wood and charcoal, a large amount of energy is wasted. Households used in the region often have bad to mediocre returns. Depending on the inhabited locality (urban or rural), proximity and accessibility of wood, income level, etc., equipment used by households are different.

With the promotion of improved stoves programs implemented in different countries, there is a more or less significant penetration of improved stoves in urban area (improved stoves with coal) and rural (improved stoves wood). However in rural areas, households with three stones that have very low yields are still heavily used. From one country to another there is a more or less interesting experience in distributing efficient cooking equipment.

A survey conducted between 2010 and 2011 in Benin and on the description of the reference situation of domestic fuels subsector, over half of the sampled households using non-economic households firewood for their needs (34.4% households 3-stones, and 16.7% households 3-stones protected). 20.5% of households use a coal uneconomic wood fireplace (wood louse) and only 3.5% use a charcoal hearth improved type "Nansou".

Equipment for the main fuel used by households is improving gradually as one moves from poor households to rich households. Indeed, in poor households the equipment for the main fuel consists mainly of homes unprotected 3-stones. In rich households the woodlouse is the equipment used for the primary fuel.

In rural areas, the equipment for the most common primary fuel is home to unprotected 3-stones (41.9%), unlike the urban and it is the cockroach that dominates (26.6%).

In Togo the Government intends to implement a proactive policy (incentives, support and training craftsmen, appropriate distribution channels, etc.) capable of promoting the distribution of improved stoves, which allows wood and charcoal economy 50 to 60%. However, improved stoves are being popular in recent years but their adoption is still timid. These homes allow law firewood savings of 30-50% (DGE / CRISTO: Survey of domestic energy consumption in Togo, 2007).

In Gambia, significant efforts have been made to the distribution of improved stoves; the most used is the NoFly and Njambar home. In Guinea Bissau, there are some actions for distribution of improved stoves, however these activities remained very scattered and small. In Guinea, the distribution policy has helped disseminate improved stoves 256 711, which helped save an estimated 506,353 tons of wood fuel or covered 6575 ha saved in 2011. This production was made by trained craftsmen (report of the study countries). About 80% of households in Liberia use traditional methods of cooking with biomass such as "coalpot" (iron triangle to support the pots with use of wood) widely used in rural areas with a low yield. Improved stoves distribution projects exist without having a significant impact on the consumption of wood energy.

Mali has a large scattering experiment of improved stoves. Through domestic energy strategy AMADER concluded a "support of the population, including women for a change of behavior in favor of energy efficiency with the intensive use of improved cooking equipment, especially with the distribution of 980 000 2005 homes in 2011. (Mrs. E. Niang, gender balance in the field of access to energy services: experiences AMADER, Presentation at the Regional

Workshop for Africa on gender mainstreaming Men-Women in the infrastructure sector, 2011 Addis Ababa). Still, after two decades of promotion of improved stoves, their penetration is still low. It is around 67% in areas of intervention AMADER.

In Senegal, since the 1980s, various players in the domestic fuels subsector have developed distribution projects and programs of improved stoves to reduce wood fuel consumption in urban and rural environments. There are a multitude of traditional stoves and improved wood and charcoal in Senegal (Sokona and Al, 2004) the most famous are the stove says "Jambar" (charcoal) and Sakkanal (wood).

In Senegal, charcoal FA allows 16% fuel economy (side dishes) to 37% (main dishes). By averaging the savings made with various homes, the economy amounts to almost 24% (RWI 2004). Regarding the improved stoves wood rural impact studies have detected a saving between 26 and 30%.

The manufacture of improved stoves is ensured by blacksmiths and potters trained beforehand. There are at Dakar 150 FA manufacturing units.

At the country level, it is estimated that about 47% and 36% respectively of the urban population use improved stoves wood and charcoal. The rate of use of improved stoves in rural areas is about 32% for wood fireplaces and less than 20% for charcoal stoves. Nevertheless, almost all households have at least two cooking equipment, reflecting the use of several types of energy (Progede2, 2014 consumer survey).

**Table 14:** Penetration Rate of different domestic fires in Senegal in 2014

Type of households	Urban Area		Rural Area
	Dakar	National	
	(%)		
Foyer 3P (FW)	52	42	58
Sakkanal (FW)	7	14	13
Ban ak Souf	4	2,9	3,1
Os	1	14	22
Fourneau malgache (C)	81	71	51
Sakkanal (C) <sup>4</sup>	3	9,4	4,7
Jambar (C)	52	17	8,8

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*Source: PROGEDE2 2014*

Given achievable jumps high yields with the distribution of improved stoves (yield can pass 20-40%) and significant amounts of wood used in the region for cooking, this option must be strengthened in the strategy and program own cooking and sustainable management of forest resources.

For several years now, the promotion of improved stoves projects and programs are developed and implemented in different countries of the region by governments and NGOs. But it has to be recognized that in most countries the results are mixed and have not given the desired results although some countries such as Mali, Senegal have efforts in the field.

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<sup>4</sup> FW means firewood

C mean charcoal

Although there is a long-term deficit in the supply situation compared to the demand for firewood, the general population does not perceive the situation dramatically. In fact, the urban consumer may not be aware of the problem. The marketing system provides an uninterrupted supply for him and apparently stable in firewood and charcoal and cheap.

However, these low prices are implicitly subsidized since the urban consumer pays considerably less than the economic cost of wood due to development charges and taxes on sales of firewood that are insignificant and sometimes not collected.

Despite small increases in the price of firewood, prices have not increased much in constant terms, and in many cases they have even decreased.

Urban consumers are not encouraged to use energy efficiently, making it difficult the adoption of improved stoves. This situation does not allow alternative energy to be competitive, unless governments agree to subsidize substantially alternative fuels. However, these subsidies are a heavy burden for already overburdened government budgets. Moreover, given that alternative fuels are available only intermittently, the consumer ends up buying them well above their economic cost, aggravating their lack of competitiveness.

Impact assessments of projects and home improvement programs were conducted in the different countries rather piecemeal. But we can retain constraints and areas for reflection and action to improve the effectiveness of projects around the following points: The production: in the area, this one is most often artisanal. Indeed, manufacturers are often blacksmith artisans with a family-like operating subservient to a lifestyle, a social vision, and a concern for transmission of values, knowledge, and expertise and know how. The production strategy is usually based on the daily subsistence cash flow in a challenging context in working capital. The artisan prefers the wider range of products to make, those with the weakest WCR with a very short turnover. Therefore, there is a peak production of improved stoves during the celebrations followed by relaxation. Several reasons make the production:

### **O The metallic improved households:**

- The supply of the raw material most often made by recovery sheets are not guaranteed and do not ensure the quality of products;
- The new sheet costs dear;
- Lack of training craftsmen despite efforts in some countries;
- The quality of non-guaranteed products;

- The precariousness of production areas (sometimes unfit to work workshops) and difficult working conditions;
- The manufacture of ceramic inserts (insert metal homes) is often a bottleneck due to: (i) low profitability compared to other ceramic products, (ii) demand weak, scattered and irregular, (iii) is another art that the forge, (iv) difficulty in raw material supply of quality etc.;
- Ceramic inserts due to lack of raw materials of good quality (clay) and competition from other more profitable ceramic products.

#### **O Improved Households irremovable clay:**

- Lack of training actors;
- Maintenance difficulties;
- The irremovable nature of the equipment.
- Marketing: the difficulties in marketing are:
  - ✓ Commercialization: The challenges lined to commercialization are:
    - O Strong competition from traditional stoves;
    - O informal distribution network;
    - O Poor communication;
    - O expensive products.
  - ✓ The low institutional support of blacksmiths at the craft sector in Senegal;
  - ✓ The lack of means of Chambers of Trade for monitoring activities of craftsmen (blacksmiths);
  - ✓ Lack of or inadequate support of local authorities in the crafts sector.

#### **5.6. Wood substitution strategy using alternative cooking energy sources:**

In general, all the ECOWAS countries have opted for a proactive policy of substitution of wood energy by other so-called modern energies such as butane gas, biofuels. This substitution was to help countries to reverse the trend of continued degradation of forest resources and security of supply in the long term cooking fuels in the best conditions of use and access. This strategy should also produce environmental benefits, including the reduction of emissions of greenhouse gases.

In all ECOWAS countries, states filed substitution policies sometimes by the grant of butane gas. This is the case in Ivory Coast where the state encourages the use of butane gas for cooking in households. However, access to certain sections of the population to petroleum products and butane gas is still low, 20% in 2010. This is due to (i) the high cost of these products; (ii) the irregular supply of the market, especially in gas and butane; (iii) the inadequacy of production and weak national capacity for butane gas storage.

To this, the weakness or lack of supply of some cities in the interior of the country is added, particularly in the districts Denguélé, Mountains, Savannah, Bandama Valley, the Woroba and Zanzan and degradation of the petroleum product distribution network due to successive crisis. This situation leads people to often resort to biomass (firewood) as a source of energy, which is a threat to the preservation of the environment and the balance of biodiversity.

Senegal and Cape Verde are countries where there's been a very high penetration rate of butane gas in cooking energy consumption.

#### **5.6.1- Wood fuel Substitution Products:**

✓ **Butane gas** is the most credible product in most countries of the sub region as a substitute for wood energy. However its level of use varies according to countries and efforts by governments to subsidize the product.

In Benin, we notice a low penetration of butane gas as cooking fuel since the cost of the first investment to consent by users (price of gas stove) is a strong barrier to the use of the product.

In Burkina Faso, the position of gas in 2004 as the dominant source used for cooking is proving to be important in Ouagadougou with 19% of users, 10% in Bobo and only 5% in Ouahigouya. But in total 46% of Ouagadougou residents commonly used gas against only 14% Bobo and 23% in Ouahigouya. The situation in Bobo is explained by the preponderance of coal (consumption of domestic fuel study in Burkina Faso, CILSS-PREDAS, 2004). Most consumers wish to adopt the use of butane gas (86% Ouahigouya, 85% in Ouagadougou and 51% in Bobo); the main constraint remains the price of fuel and equipment. These are the households of small to medium size with rather high incomes that have mostly adopted this fuel; large families prefer to maintain the status quo (the use of firewood as the dominant energy). There was a steady growth in the penetration rate of gas between 1996 and 2004 related to the grant (330 CFA francs per kg in 2004) of the product since 1987, the introduction of bottles 3 and 6kg (broadening the base consumers) and strengthening of the bottle park at

STD-SODIGAZ (the country's main gas distributor). During the period 1996-2003, the average annual growth rate of gas sales in Burkina Faso was 28%. The general trend is especially the substitution of wood and charcoal by gas at ordinary households. But the pace of progress remains slow mainly because of the very low level of household income.

In Gambia, consumption of butane gas represents approximately 0.5% of the total energy consumption. In Ghana only 18.2% of households use the main cooking fuel butane gas. The low level of household income and the availability of cheap coal wood limit the penetration of butane gas in Guinea Bissau. Similarly, psychosis gas accidents and "preferred flavors of dishes cooked over a wood fire" reinforce this situation. A socioeconomic survey of household energy conducted in 2011 revealed that in relation to cooking energy, only 1% of households are using gas stoves. The same survey indicates that the ability to pay for the butane gas would be about 3,815 XOF per household at the national level, which would be given the prices just over 4 kg of butane per month per household.

Only 1.5% of the Guinean population (2011) has access to the modern kitchen user butane gas for cooking and heating water for domestic use, the supply of butane gas channels are not decentralized enough (very few outlets, with the exception of the city of Conakry). Promoting the use of butane gas as a substitute for wood fuel (firewood and charcoal) is still very shy. All the more so that the consumer price of butane gas has been increasing for ten years. It reached a record high, meaning the highest in the sub-region (about 35 USD: for refilling the bottle of 12.5 kg and 23 USD: for refilling 2.7 Kg) and the purchase cost of user equipment (stove, gas stove) is also a barrier.

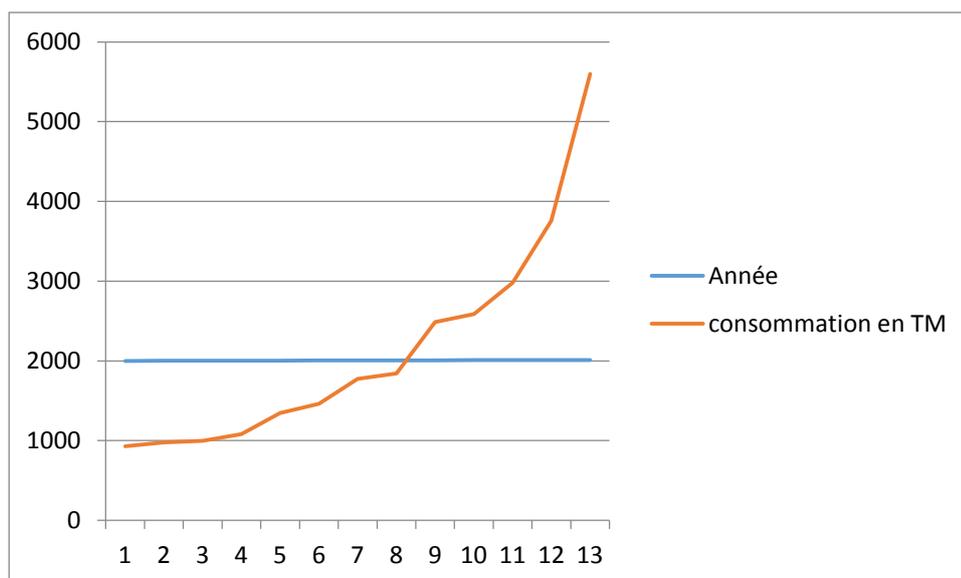
In Mali, butane gas has had a significant input in households. However, this penetration does not have a decisive impact on the wood energy consumption level because it is used only as a supplementary fuel. The level of imports is low enough and the acquisition costs are high. The state subsidizes the fuel consumption of which is consolidated in the urban centers. The annual consumption is around 20,000 tons butane. It remains one of the lowest in the region. The current fleet of all bottle packaging is about 200,000 bottles including 180,000 bottles of 6 kg. With an average turnover rate of bottle 0.6 times / month, the minimum park will be about more than one million bottles. The specific problem of gas bottles has now become a major problem in addition to price, which is also a barrier.

Niger is a producer of butane gas. However for gas and mineral coal, missing implementing legislation on trade, distribution and product standards. The Gas Regional Program had funded the production and marketing of small packaging (3 and 6 kg) up to 50% in 1992. The Action Plan 1990-1993 foresaw the sale of gas stoves to 24,000 but in September 1993, Total sales exceeded 11,000 units hardly putting into question the scope of the program in achieving the initial objectives and relevance in the context mentioned.

Currently with 100% subsidy for gas and the creation of new distribution companies, there is massive importation of gas stoves. The implementation of energy policy will lead to an enhancement of the substitution rate of 1% in 2000 to 17.4% in 2020 with the current promotion of natural gas by SORAZ. The Niger ensured its consumption of butane gas in the CONSULTING market before the arrival of the SORAZ in late 2011.

Production of the Zinder refinery (SORAZ) is estimated eventually to 70,000 MT per year. From January 2012 to December 2012, the SORAZ produced 37,978 MT, which largely covers the current needs of the Niger. The current average price is 530 FCFA / kg. Since Niger became a producer of gas, the consumption of Niger 's households mainly in the capital butane gas increases gradually, anything that bodes better tomorrow on the fight against deforestation and desertification.

Between 2000 and 2011, domestic consumption of butane gas increased from 931.6 TM to 3 754.41 TM in 2011 or a volume four times greater than in 2000. In 2012, domestic gas consumption increased 5 TM 598 six times more than in 2000 and 1.5 times more than in 2011; which corresponds to a growth rate of around 50%. The following table shows the consumption and the growth rate between 2000 and 2012.



**Figure 16:** Evolution of the consumption of butane gas in Niger 2000-2012

*Source: Country Report, Study on the evaluation of the ECOWAS Forest Resources*

Despite this development potential, constraints to butanization are:

- High gas prices and the accessories (pipes, valves, burners...),
- Culinary habits of households;
- Low technical and financial capacity of gas operators;
- Low storage capacity and filling;
- Low distribution network concentrated only in large centers like Niamey (has four filling stations in six);
- Failure by households to know of the benefits of gas as an alternative fuel;
- Fear of gas as a product that can cause explosions;
- Uncollected natural gas relationship (the relationship to wood is more cultural);
- Low cost of wood energy, especially in rural areas and secondary urban centers).

Nigeria has consumed 30% (250,000 tons) on 850,000 tons of liquefied petroleum gas (LPG) reserved for domestic use in 2013. (K. KALEJAYE, 2013 article in Vanguard, <http://www.vanguardngr.com/2014 / 03 / Consumed-nigeria-250000-ton-lpg-ppmc 2013 />). This percentage corresponds to 1.8 kg per capita ratio below the regional average for West Africa 3.5 kg.

Nigeria is among the lowest consumer countries of LPG in Africa. There's a strong demand for "gas" to reverse this trend to maximize the benefits of this abundant resource in this country. Indeed, kerosene is popular as cooking fuel with a grant. The constraints to the promotion of the gas are: (i) the high cost of gas cylinders and accessories (barrier first acquisition), low public awareness, poor infrastructure (distribution, storage etc.), competition kerosene subsidized and a lack of investment in the value chain.

In Sierra Leone, there is a strong will of the State to promote the butane gas as a substitute for wood energy. In 2010, gas consumption reached 1,000 ToE. However LPG is expensive and suffers from supply shortages. The prices are not regulated and price increases were recorded in the past, which makes it unaffordable and unreliable. In addition, there is no cylinder filling control and the absence of standards on the quality and type of bottles or security in the connection between the bottles and accessories equipment. Thus, some consumers still perceive real safety problems with the use of LPG. As a result, people in cities still use charcoal, even if they have an LPG home.

In Togo, the use of butane gas is very low key and only 4.3% of households. It is mainly used for cooking (stove, oven, gas hob) and certain outdoor that use low power. In 2006, households and 50% by other agents can estimate domestic gas consumption at around 1850 tons of which 50% are consumed. With the promotion of the gas stoves adapted to the cooking habits, use of butane gas causes more membership. However, the perceived risk of accidents, doubt about the ability of gas stoves to cook large quantities of food or prepare local beers, repeated shortages of gas, the price considered high, are all barriers that limit adoption gas by households. Some Togolese do not hesitate to source from Ghana where the price is cheaper and more detailed.

## **LPG POLICY IN SENEGAL:**

In Senegal the LPG campaign began in 1974 to ensure consistency between the energy and forest policy of the country. It was designed to ease the pressure on forest resources exerted by the exploitation to meet the needs of cooking energy populations. It was to subsidize butane gas which could be used by the disadvantaged classes (bottle of 2.7 and 6 kg), promote the installation of filling stations by gas distributors throughout the country to facilitate the gas distribution, transportation reimbursement package for gas distributors to avoid the higher prices that would be due to transportation costs.

Forty years later, we can say that this policy orientation has been a success in terms of objectives. Indeed, it has helped boost the consumption of butane gas which is currently estimated at 120,000 tons

per year. Although this surge did not allow full substitution of charcoal, it has to recognize that the butane gas has become, especially in urban centers, a key fuel. But this was accompanied by a significant financial pressure that has cost the state budget 237 billion CFA francs for the period from 1987 to 2009. (*LPDSE, 2012, quoted by the impact study the removal of the subsidy of butane gas for households and small production units and market services: Case Dakar ', ENDA 2013*).

To cope with the weight of the expenses related to the grant from the national budget, the government has gradually raised the subsidy on LPG from July 1998 to June 2009. To support customers, the lifting of the grant has been accompanied by a voluntary policy of zero-rating of LPG (abolition of VAT and Customs Duties) and revised up the profit margins of distributors and wholesalers. It was noted subsequent to these measures:

**For households:** (i) *the return to charcoal because that seems cheaper bought in small quantities (rate coal use rose from 77.8% to 90.2%); (ii) Loss of Range of gas as primary energy for the benefit of charcoal (% of households using LPG as the main cooking energy decreased by 97.2% to 70%); (iii) increase energy expenditure etc.*

**For small units of production and market services:** (i) *increase of over 75% of*

✓ **Kerosene:**

In Niger, petroleum products consumption has experienced an average decrease of 7.8% per year from 2004, following the reduction in the consumption of kerosene resulting from the removal of government subsidy on the fuel (SIE-Niger report 2007) the situation will straighten up when its production price scale didn't have a good reputation because the first generation models were not easy to use and were dangerous.

In Togo, it is estimated that national consumption of kerosene in 2006 was about 31,000 tons, of which almost 20 000 tons (65%) would be consumed by rural households, 8,000 tons (25%) of urban households and 3000 tons (10%) by other agents. In Senegal, development projects have attempted to introduce kerosene stoves especially in rural areas with little success. Indeed, the discontinuous distribution network of the product causing shortages especially in rural areas, the high price and the unsuitability of homes has formed barriers that have hindered those initiatives.

Nigeria remains the largest user of kerosene as cooking fuel country with a grant. The consumption share in other countries remains low.

✓ **Biogas:**

Produced by the anaerobic fermentation of organic matter can directly replace natural gas for the production of electricity, cooking and heating, cogeneration, fuel. It can be produced through anaerobic digestion units, family digesters and landfills (biogas trapping). At the regional level, we are witnessing the development of projects to promote this form of energy whose consumption remains low at regional level.

✓ **Solar:**

The technologies of solar energy systems are generally either thermal type (solar heating, cooling, drying, thermal power, etc.) or the type of photovoltaic (direct conversion to electricity). The countries have taken initiatives to try to introduce solar cookers in many countries without achieving results levels could have a significant impact in the cooking energy sector.

✓ **Energy Briquettes:**

Which consist of unused biomass but also from the charcoal dust that typically settles to the bottom of the bags and represents 15% of the production of charcoal and mixed with a binder (cassava mixture e.g.), which are then compressed and dried in the sun. These briquettes, depending on the biomass-based, have a variable calorific value, but not negligible. They thus

replace energy wood as a cooking fuel. They also have the advantage of being used directly in conventional furnaces. They can be made from rice husk, cocoa pods, of maize cotton, coffee residues, peanut, coconut, paper and jatropha. Mali and Senegal have developed interesting projects in this area.

✓ **Bagasse:**

The resulting material is the sugar cane sugar extraction activity. It is an agricultural residue that has no nutritional value. Its use as an energy source is attractive because it does not deprive the agricultural activity of an important nutrient input. As an energy source, the bagasse can be used as such, that is to say directly burned without any transformation. It can also be converted into carbon by carbonization process. The resulting coal will be mixed with a mixture composed of water and cassava (manioc), and compressed into briquettes. These briquettes are dried in the sun for about a week.

**5.7. Institutional Framework For The Development Of Cooking Energy Sector:**

In all ECOWAS countries there is no single institution responsible for development of cooking energy sector, although everywhere it is usually the ministry in charge of energy that plays the biggest role. Indeed, many institutions both public and private sector must work in synergy to achieve true promotion of alternative fuels to wood fuels. The magnitude of the gap to improve the energy efficiency of chains of biomass energy (fuel wood, charcoal, forestry residues agro, biogas, biofuels, etc.) requires the establishment of a formal framework Interdepartmental consultation and coordination (especially between the Ministries of Energy, Environment and Development at the base), on one hand, and the creation of a coordinating body and promoting strategies and initiatives energy efficiency (shutters wood carbonization, improved stoves, butane gas substitution, promotion of biofuels, etc.), on the other.

Greater efficiency in the use of the cooking energy is possible through the massive distribution of efficient cooking equipment. This was demonstrated by the projects initiated in the area by different countries. Also, substitution of wood energy by alternative sources of clean cooking energy, accessible is a necessity shared by all countries to limit forest resource degradation and the adverse effects of climate change. However, despite their relevance, the experiences of different countries allow to highlight the difficulties expected targets of developed projects. The complexity of the situation born among others, the transversal nature of energy and its technical content, institutional and socio-economic. Important questions must now be addressed

and answered and clear strategies should be developed and implemented according to national and local contexts.

How to further involve the private sector in the sectors of production and marketing of equipment for cooking and alternative energy sources to wood energy? What role for governments? What place and implementation measures? And finally, can we control the results of our operations; we adapt our energy policies based on the results and what monitoring and evaluation at national and sub regional level? How to pursue joint initiatives with regional indicators and common modalities of implementation and concerted?

### **5.8. Harmonization Of Policies In The Energy Sector Regional Cooking:**

In the sub-region, several initiatives are undertaken by countries to promote efficient cooking WACCA (West African Clean Cooking Alliance) to increase the efficiency and sustainability of biomass energy for cooking and to promote the use of alternative biofuels wood energy. They also aim to ensure access to fuel and efficient cooking appliances, sustainable and modern in 2030 for the general population of ECOWAS. However, these initiatives are taken and implemented in isolation without any strategy or harmonization of sharing successful experiences at the regional level. Given the similarities that characterize our spaces, it would be important to share successful experiences to harmonize policies in the cooking energy sector at a regional level. Concerning that, he welcomed the initiative of PREDAS / CILSS which has harmonized domestic energy strategies in CILSS countries although the implementation of those did not follow up with a sub regional approach to a unity of action.

The WACCA can be an interesting framework for this necessary harmonization of policies and strategies at regional level. The elements that constitute the framework and the basis of WACCA Regional Action Plan include:

#### ✓ **The political and regulatory framework:**

A regional policy framework for clean cooking should be developed and adopted by State Members.

#### ✓ **The supply of cooking fuel chain:**

To ensure access to clean cooking energy, effective, safe, affordable, all of the cooking energy chain must be adequately addressed. Thus, in collaboration with the relevant departments at the

regional and national level, actions on the sector sustainable cooking fuels will include the development of policies and strategies of production, transformation, transportation, distribution and consumption.

✓ **Actions gender sensitive and economic empowerment of women:**

The development and implementation of policies and gender-sensitive programs for clean and efficient cooking are of paramount importance. Particular attention should be paid to the economic empowerment of women through their increased involvement in the sectors of energy cooking).

✓ **Capacity building:**

Capacity building to enhance knowledge and skills is a prerequisite for improving the situation of the cooking energy. It is essential that all the capacity building activities pay great attention to the gender balance. Capacity-building activities should be adapted to the specific demands of the target group.

- ✓ Work at a market transformation of fuel and cooking appliances;
- ✓ Implement a standards and labeling mechanism;
- ✓ Create a regional hub for data centralization and sharing of knowledge and experience in technology and innovation, and establishing links with selected research centers;
- ✓ Implement demonstration/pilot projects for implementation at the regional level.

**Recommendations:**

Recommendations may be technical, socio-economic and institutional:

1. At the institutional level:

- a. The harmonization of policies, strategies and procedures for implementing projects and programs. At this level, it should be guided by the approach of PREDAS in defining strategies but ensuring define regional indicators and countries contribution levels to have a clear consolidation strategy;

- b. Preparation of legislative and regulatory framework for promotion of efficient cooking devices and alternative cooking energy for the development of regional cooperation exploiting the comparative advantages of countries,
- c. Study grants carefully as equipment and energy sources to promote, the countries concerned and their respective comparative advantages, define their levels of mobilization procedures, their temporal evolution, roles and responsibilities of the beneficiaries, their compatibility with carbon finance etc.
- d. Defining an effective strategy for involving the private sector ensuring sustainability
- e. Setting standards and conditions of their applications etc.

2. At the technical level:

- a. Improving efficiency efficient cooking equipment with production standards for the certification of returns;
- b. Define measurement protocol equipment efficiency and energy sources for a comparison between equipment
- c. Developing research development on cooking equipment and SEA,
- d. Develop training modules and curricula
- e. Better document the potential impact of the distribution of ECE SEA and climate to better seize opportunities related to carbon finance.

3. At the socioeconomic level:

- a. Doing market research equipment and SEA countries to levels that can engage the private sector:
- b. Develop social marketing programs to engage the consumer to create a viable market,
- c. Document the socio-economic impacts of the promotion of ECE and SEA
- d. Document the impact of the promotion of ECE and SEA on the health of women and children.

**Conclusion:**

The Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE) is a specialized agency of the Economic Community of West African States (ECOWAS), whose main objective is to contribute to economic development, social and sustainable development of the West African environment by improving access to modern, reliable and affordable energy services and energy security and reduction of greenhouse gas emissions related to energy and climate change impacts.

To achieve its objective, the CEREC must consider the context of ECOWAS countries regarding their energy resources, strengths and constraints for their optimal use.

The energy profile of the countries in the field of cooking energy is quite similar. They all depend on forest resources to meet their cooking energy needs. Indeed biomass is between 50 and 90% of the final energy consumption.

Analysis Offer / wood energy request shows that the supply of the country is not sustainable because there is a gradual degradation of resources. The analysis of intra-country supply shows that in the ECOWAS region, despite the existence of deficient regions fuel wood within countries, supply is ensured by a transport region between wood energy. ECOWAS region is still self-sufficient in energy wood and exchanges between countries of fuel wood are almost nonexistent except in Gambia, where there was a massive importation of timber, heating and charcoal from Senegal.

The wood energy demand is growing and is maintained by: (i) the population's beliefs, (ii) the rate of urbanization (iii) cooking practices subservient wood energy, (iv) accessibility (availability, price, etc.) of wood energy etc.

Aware of the unsustainability of supply of wood energy given the unsustainable exploitation, countries have developed projects and programs to disseminate improved stoves to increase energy efficiency in the sector. The experimental results are often mixed at country level, especially in the introduction of a more efficient carbonization wheel. Alongside some alternative energy sources have been promoted without much success in the region such as butane gas, kerosene, biochar, etc.

These experiences have been limited due to various constraints, among which may be noted; Relativity efficiency equipment (again depending on the level of training of actors), the absence

or insufficiency of consensus standards, the still high price of equipment and alternative energy sources, the irregularity of supply , etc.

For the success of these projects, it is urgent to put a regional program of clean cooking sector with a clear definition of options regarding the involvement of the private sector, the role of States, grants management, research development the adaptation of laws and regulations, communication and sensitization of stakeholders.

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