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## **COMMUNITY FOREST MANAGEMENT AND ITS IMPLICATION ON FOREST RESOURCES SUSTAINABILITY: THE CASE OF TORODI COMMUNITY FOREST, NIGER REPUBLIC**

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### **ABSTRACT**

In Niger, forests occupy a dominant position as energy sources used by over 87% of Nigerien households for domestic combustion. This reveals an alarming fact when taking into consideration the rate of population growth, the current state of the forest and the demand for wood energy. To address these issues, the Niger government undertook a reform in forest policy to introduce new forest management practices. The reform promotes a local community forest management approach to create the conditions for greater accountability of local communities in the management of the local forest resources, with the establishment of rural wood markets, a new system of exploitation and commercialization of forest wood to supply urban centres. The local forest management concept has brought about a range of initiatives for rural community development ranging from economic empowerment of local people to assigning responsibility for local forest resources management. There are, nevertheless, important issues that are not yet well addressed such as the sustainability of the forest exploitation and forest management. This study, based on findings from Torodi zone after 20 years of practices, revealed significant dysfunctions in the community forest management approach. These issues are mostly institutional; the government hasn't instituted measures for sustainable exploitation

of the forests, good governance of local resources and operational system for the funding of forest control and restoration actions. To promote sustainability in local community forest exploitation, the management plans have to be renewed and set for all rural wood markets; Local Management Structures (LMS) should be assisted with forest controllers; good governance and gender balance have to prevail. The system for the allocation of the municipality forest management fund and the forest protection fund has to be reviewed to better meet the needs of local communities.

**Keywords:** community forest management, sustainability, wood energy, Local Management Structures, community development

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## TABLE OF CONTENT

ABSTRACT .....	I
LIST OF FIGURES .....	IV
LIST OF TABLES .....	IV
1 INTRODUCTION.....	1
1.1. STATEMENT OF THE PROBLEM.....	1
1.2. RESEARCH OBJECTIVES .....	2
1.2.1. Main objective .....	2
1.2.2 Specific Objectives.....	2
1.2.3 Research questions.....	2
2 DEFINITION AND BACKGROUND INFORMATION.....	3
2.1 FOREST RESOURCES AND SUSTAINABILITY .....	3
2.2 COMMUNITY FOREST MANAGEMENT CONCEPT .....	4
2.3 COMMUNITY FOREST MANAGEMENT AND IMPLICATIONS.....	4
2.4 COMMUNITY FOREST MANAGEMENT AND GENDER ISSUES .....	4
2.5 COMMUNITY FOREST MANAGEMENT: THE NIGER APPROACHES .....	5
2.5.1 The Local Management Structures (LMS): .....	5
2.5.2 Forest Management Plan (FMP): .....	6
2.5.3 Rural wood market.....	6
2.5.4 Tax system, distribution and uses.....	7
2.6. IMPLICATION FOR LIVELIHOOD IMPROVEMENT .....	8
3 METHODS .....	8
3.1 STUDY AREAS .....	8
3.1.1 Administrative and social organization.....	10
3.2 RESEARCH METHODS AND DATA .....	10
3.3 DATA ANALYSIS .....	11
3.4 CONSTRAINTS AND LIMITS OF RESEARCH.....	11
4 RESULTS.....	11
4.1 MANAGEMENT OF COMMUNITY FOREST RESOURCES AND RURAL WOOD MARKETS.....	11
4.1.1 Management approach for the governance of the local forest.....	12
4.1.2 Management approach to maintain the local forest condition.....	13
4.2. RESPECT FOR REGULATIONS IN FOREST EXPLOITATION .....	14
4.3. REVENUES AND OTHER BENEFITS OF FOREST EXPLOITATION ON COMMUNITY DEVELOPMENT	15
4.3.1. Tax system, distribution and uses.....	16
4.3.2. Local revenues and the social investments.....	17
4.3.3. Other revenues generated from forest exploitation.....	18
4.4. FOREST MANAGEMENT FUND AND FOREST RESTORATION .....	20
4.5. PERCEPTION OF THE LOCAL COMMUNITY ON THE EXPLOITATION OF FOREST RESOURCES IN TORODI.....	21
5 DISCUSSION.....	22

5.1. MANAGEMENT OF THE COMMUNITY FOREST RESOURCES AND RURAL WOOD MARKETS IN TORODI.....	22
5.1.1. Management approach to governance of the local forest .....	23
5.2. FOREST EXPLOITATION.....	23
5.3. THE BENEFIT OF FOREST EXPLOITATION .....	24
5.4. FOREST FUND AND FOREST MANAGEMENT .....	24
5.5. PERCEPTION OF THE LOCAL COMMUNITY ON THE EXPLOITATION OF FOREST RESOURCES IN TORODI.....	24
6 CONCLUSION AND RECOMMENDATIONS .....	25
ACKNOWLEDGEMENTS .....	27
REFERENCES .....	27
APPENDICES:.....	33
APPENDICES 1: QUESTIONNAIRES FOR VILLAGE GROUP - LOCAL MANAGEMENT STRUCTURE .....	33
MERCI DE NOUS DONNER VOTRE TEMPS ( <i>THANK YOU FOR GIVING US YOUR TIME</i> ).....	35
APPENDICES 2: QUESTIONNAIRES FOR THE TORODI FOREST ADMINISTRATION .....	36
APPENDICES 3: QUESTIONNAIRES FOR TORODI MUNICIPALITIES .....	37

**List of figures:**

Figure 1. Torodi position in Niger and Tilaberi region .....	9
Figure 2. Map of Torodi showing the 4 ecological zones .....	9
Figure 3. Actual situation of the Torodi community forest.....	14
Figure 4: Taxes distribution among beneficiaries based on the type of rural wood market (WM).....	16
Figure 5: Uses of the shares allocated to each beneficiary in an oriented market system.....	17
Figure 6. Uses of the shares allocated to each beneficiary in a controlled market system.....	17
Figure 7. Tax revenues collected and their allocation for the last five years .....	18
Figure 8. Social realisation by the local community .....	18
Figure 9. Distribution of the revenue from wood exploitation among stakeholders .....	19
Figure 10. Goat distribution to women in Torodi village.....	20
Figure 11. Torodi local forest controllers equipped with motorcycles.....	20

**List of tables:**

Table 1. Tax fees based on the type of exploitation and distance to the urban centre .....	7
Table 2. Institutional management indicators .....	12
Table 3. Governance indicators.....	13
Table 4. Indicators for sustainable management to maintain the condition of the forest .....	14
Table 5. Criteria for sustainable forest exploitation .....	15
Table 6: Revenues allocated to forest management from the share of stakeholders .....	21

## 1 INTRODUCTION

### 1.1. Statement of the problem

In Niger, forests occupy a dominant position as energy sources used for domestic combustion. Over 87% of Nigerien households use wood as the main source of domestic energy. According to the energy information report, biomass, mainly wood, covers 87% of household energy needs (Nouhou et al. 2007). This situation continues to call not only for the development of conditions for sustainable forest management but also for maintaining and securing the potential forest resources for the supply of wood fuel (Kinni & Sive 1987; Gerald 1997; Lambin & Ehrlich 1997; Kramer 2010; Oumarou 2012). In quantitative terms, the need for wood as energy source at the national level currently exceeds 3 million tons per year, representing a monetary value of more than 105 billion FCFA (Ministry of Hydraulics and Environment 2012). This reveals an alarming fact when taking into consideration the population growth, the current state of the forest areas and the forest growth. The forest estate is less than 8 million hectares and produces annually less than 2 million tons of wood, while the demand for wood would be more than 5 million tons per year, resulting in a deficit of more than 2 million tons (Ministry of Hydraulics and Environment 2012). This gap is unfortunately closed largely by harvesting the forest reproductive stock (Ministry of Hydraulics and Environment 2012). The balance between supply and demand of wood for energy remains a deficit, showing a regressive tendency to forest resources (Oumarou 2012, Ministry of Hydraulics and Environment 2012).

From 1989, the Niger government has initiated significant forest policy reforms. The purpose of these reforms is to create conditions for greater accountability of local communities in the management of the forest resources of their territories (Adamou et al. 2007). With the reform, the new Household Energy Strategy (HHES) centred on a participatory and sustainable management of forest resources was established to meet the need for wood energy in urban and rural areas. Rural firewood markets were also established to introduce new forest management practices (Gerald 1997). The reforms have, among others, led to the establishment of a tax on the transportation of wood to the urban centres, a new forest monitoring system to ensure sustainable exploitation of stands and regularity in tax perception, distribution, payment and uses by different stakeholders involved in the forest wood business (Ministry of Hydraulics and Environment 1992; Ministry of Hydraulics and Environment 1996; Adamou et al. 2009).

The new policy further aims for rational management of forest resources to maintain the balance of ecosystems, hence the ecological, social and economic aspect of the forests (Siry et al. 2005). An important aspect of this is to direct spatially dynamic firewood logging for energy to less vulnerable areas and to transfer management of forest resources to the local community (Ministry of Hydraulics and Environment 1996).

The increasing need for fuel wood, land for agriculture and livestock rearing, mainly due to continuous population growth, has put heavy pressure on the natural resources in West Africa in general (Ribot 1999) and the Torodi forest zone specifically (Duhem 2007). This is increased by the harsh climatic condition of the country (Lambin & Ehrlich 1997).

According to the study by the project GESFORCOM (“Gestion des Forêts Communes et Communautaire or Local Community Based Forest Management in English), the Torodi forest has been decreasing in area by more than 2% annually since 1996. This is due to expansion of agricultural land, and the fallow land system is also in net regression, passing from 7.5 years to 2.5 years (GESFORCOM 2007). Shifting cultivation, grazing, mismanagement and

uncontrolled forest exploitation also contribute significantly to the degradation of Torodi forest (Amani 2008). The challenges associated with forest resources scarcity and the degradation of the forest potential in conditions of an ever-growing population and poverty have to be addressed. The situation of the Torodi forest zone has to be reviewed with a double objective: the preservation of the resources and the satisfaction of the needs of the local population (Ministry of Hydraulics and Environment 1992; Wunder 2001; Tutu & Akol 2009; Ministry of Hydraulics and Environment 2012).

Local Community Forest Management (LCFM) is one of the approaches and initiatives implemented by the Niger government through the Forestry Administration, aimed at sound management of the forest ecosystem and satisfaction of the needs of households (Laoualy et al. 2004; Larwanou et al. 2006; Oumarou 2012). Through this approach, rural wood markets and local structures of forest management have been established to exploit forest resources in their delimited areas for a final solution with management by the local people who can then support themselves by the forest resources within their own areas (Gerarld et al. 2002).

Although the Local Community Forest Management concept has brought about a range of initiatives for rural community development from economic empowerment to assigning responsibility for local forest resources management (Gerarld et al. 2002), there are, nevertheless, important issues which need to be addressed such as the sustainability of the forest exploitation. Results in most cases, and in the Torodi zone especially, after 20 years of practice, reveal some dysfunctions in the community forest management (Adamou & Garba 2011). It is therefore, important to look at how forest exploitation impacts the regeneration of the communal forest, as well as its implication for forest resource sustainability.

To properly understand the implication of the Local Community Forest Management in forest resources sustainability in Niger, a case study of the Torodi forest zone was used to investigate how local communities are working to sustainably maintain their forest through the established rural wood markets. The focus was on management practices and the socio-economic and ecological impact.

## **1.2. Research objectives**

### *1.2.1. Main objective*

The main objective of this study was to assess the sustainability of the management system of the rural wood market in the local community forest exploitation of fuel wood and draw recommendations for future policies in forest conservation and management.

### *1.2.2 Specific Objectives*

1. To assess the efficiency of the local structure in managing rural wood markets
2. To assess the socio-economic impact of the forest exploitation through the rural wood market in the Torodi district
3. To assess the impact of the fuel wood exploitation on the local forest and its sustainability in the Torodi community forest

### *1.2.3 Research questions*

The following questions guided the conduct of this project:

- How are community forest resources and rural wood market managed in the Torodi district?
- Have the rules and regulations stated for the sustainable exploitation of forest resources been followed to maintain the forest ecosystem dynamic?
- Is exploitation of forest resources improving the income of the rural population in Torodi?
- Are the revenues from forest exploitation for forest management sufficient and used for forest restoration?
- How do the communities perceive forest exploitation in the Torodi district?

Answers to these questions could contribute to new approaches in the rural community forest management and exploitation of rural fuel wood markets and the consolidation of existing facilities and practices.

## **2 DEFINITION AND BACKGROUND INFORMATION**

The degradation of natural resources and their subsequent impacts on the environment and livelihood, especially in rural areas (Adhikari et al. 2004), have drawn the attention of policy makers and scholars in natural resources governance in order to seek sustainable management of the common resources (Agrawal 2001). Forests are among the most affected natural resources, especially in Africa (Allen & Barnes 1985; Lambin & Ehrlich 1997). Large areas of woodland are seriously damaged and transformed for crop production, grazing and shifting cultivation, reducing their ability to provide food for the forest dwellers and their capacity for carbon sequestration (Saunders et al. 1991; Houghton 1995; Lambin & Ehrlich 1997). Improved forest management practices can meet the needs of people for wood and non-wood forest products and may contribute to biodiversity conservation, water and soil stability and increase carbon sequestration (Wunder 2001; Wang 2004; Siry et al. 2005). These practices include sustainable forest harvesting and efficient use of wood fuels (Houghton 1996; Trombulak et al. 2004; Zulu 2010). However, in order to be sustainable, these management practices must take into account the three pillars of sustainability and development: the social, the ecological and the economic aspects (Sunderlin et al. 2005).

### **2.1 Forest resources and sustainability**

The concept of sustainability arises from the concept of sustainable development. It underlines the relationship between economic development, environmental quality, and social equity (Roger et al. 2008), while the concept of sustainable forest management is developed from The Rio Conference in 1992 on Environment and Development on one hand and the Intergovernmental Panel and Fora on Forest on the other (Roger et al. 2008). It refers generally to the ways and processes of managing forest resources to meet society's varied needs, today and in the future, without compromising the ecological capacity and the renewal potential of the forest resource base (McDonald & Lane 2004; Wang 2004; Siry et al. 2005). Thus sustainable forest management implies access to the forest resources, equitable distribution of costs and benefits, while also maintaining the productive capacity of the forest so to meet the need of future generations (McDonald & Lane 2004; Price 2007).

## **2.2 Community Forest Management concept**

The recognition of the rights of the community to forest resources and the limitation of the state to solidly control sustainable use of resources has brought forward the concept of community forest management (Agrawal & Gibson 1999; Agrawal 2001). It is believed that the people of the community are the best managers of resources near where they live since they have a long term need for and relation with these resources. They also possess more knowledge about these resources than other potential actors (Agrawal & Gibson 1999). Excluding them from any local resources management project may lead to possible failure and can be destructive to the common resources (Klooster & Masera 2000; Castro & Nielsen 2001; Adhikari et al. 2004).

## **2.3 Community Forest Management and implications**

Community Forest Management refers to the decentralization of governance of forest resources (Nygren 2005). It involves the transfer of authority in forest resources management from the central state to local communities (Klooster & Masera 2000; Castro & Nielsen 2001; Nygren 2005). It's a communal arrangement, often jointly by the central government, the local authorities and different stakeholders involved in forest resources governance aiming to promote efficiency, equity and sustainability in the exploitation of forest resources and uses (McDonald & Lane 2004; Nelson & Agrawal 2008; Inoni 2009). Other scholars see community forest management as the right and power of local people to access, use, and manage forest resources in their common boundary of jurisdiction (Brand 1997; Leach et al. 1999; Blaikie 2006; Cabbage et al. 2007). Community Forest Management is therefore a tool to encourage efficient forest resource exploitation and uses. It considers the full participation of the local population in the use of resource use and decision making (Agrawal & Gupta 2005; Armitage 2005). It may act as a cursor and a good tool for setting up successful developmental strategies for economic growth and poverty reduction, especially in Africa where development is related to the continuous access to forest resources, either for food or for energy (Tutu & Akol 2009). Community Forest Management may increase the sustainability of the forest resources (Zhao & Tang 2011). It can also reduce land degradation, reduce environmental risks and increase biodiversity (Leach et al. 1999; Trombulak et al. 2004). However, this depends on the capacity of the community to manage the forest and its ability to withstand the internal and external social factors associated with forest resources exploitation (Armitage 2005). These contingencies may be technical, political, financial and cultural. The adaptive capacities of any community to manage these factors determine its efficiency in sustainable management of the communal resources (Armitage 2005; Belcher et al. 2005). Forest management can also face competition with other land use activities intended to improve livelihoods, revenue earning, investment and labour input (Oksanen & Mersmann 2003; Ndoye & Tieguhong 2004).

## **2.4 Community Forest Management and gender issues**

Women often manage forest resources as part of their daily activities as farmers and household providers. To meet family needs, rural women and girls frequently walk long distances to collect fuel wood, water and others commodities. Despite their reliance on forest resources, women have less access to and control over them than men do and custom in many case limits women's rights to only the right of use, and these rights are highly precarious and controlled by men. Such a situation drives women to totally depend on common property resources for their need for wood, fodder and food.

Today, with large scale deforestation and various management practices and forest privatization, women in many parts of the world may lose access to such common property forests (Foley 1997; Lise 2000; Foley et al. 2007; Young 2014). However, to be able to stand the subsequent change and to well protect the available forest resources, rural women and men must be empowered to participate in decision making that affects their needs and vulnerabilities (Luyet et al. 2012). Additionally, because of the growing demand for forest goods and services, a strategic approach for sustainable forest management is needed to optimize the forest capacity. This approach involves the participation of all stakeholders and should take into account the gender dimension in policy making and legislation to enhance the contribution of forests in livelihoods, and make the forestry sector more economically viable for land use option (Ghai & Vivian 2014). Thus, gender equity and welfare implications have to be addressed in community forest management. Addressing the gender dimensions in natural resources management will help policy makers formulate more effective interventions for their conservation and sustainable use (Agrawal & Gupta 2005).

## **2.5 Community Forest Management: the Niger approaches**

The Household Energy Strategy as one of the main axes of forest policy reforms was enacted to supply large cities with fuel wood as the main source of domestic energy through community forests (Laoualy et al. 2004; Nouhou et al. 2007; Oumarou 2012). This policy has among other objectives the rational use of forest resources to improve the economic and commercial value of wood in the rural areas and to increase the income of rural people and meet the energy needs in the urban areas (Adamou et al. 2007).

The reform is organized around the exploitation of forest products, especially wood for fuel, through the direct control of rural population, with little or no intervention of forestry administration (Gerald 1997). The only devolution role of the forestry administration is the monitoring of wood exploitation and flow to ensure compliance with the management instructions: respect of cutting standards, compartment layout, and equal distribution of income and tax levies among local authorities and central government (Gerarld et al. 2002). The Forest Administration is also concerned with the institutional aspects of the rural market by ensuring the promotion of local initiatives, forest restoration, democratic and transparent functioning of the Local Management Structures (LMS) and a sound use of funds by members of the LMS (Adamou et al. 2009). A key for tax levied and earned revenues sharing was adopted that takes into account the local populations, the municipalities and the State.

Under this strategy, local communities were formally assigned ownership of their surrounding natural woodlands and total rights of exploitation and sale of all forest products exploited from the woodland (Oumarou 2012). At the end of 1994, about 50 rural wood markets associated with village management structures were established throughout the country (Laoualy et al. 2004). This approach takes into account all forest areas that local people can exploit and manage for commercial purposes (Gerald 1997). At present, 274 rural wood markets are established in Niger. The Tillaberi region, the area of this study, with its 6 departments or districts accounts for 140 rural markets with 62 of them are located in Torodi Department (Ministry of Hydraulic and Environment 2012).

### *2.5.1 The Local Management Structures (LMS):*

LSM is a legal committee, set up by the village, or group of villages, to which the mandate for the management of the local forest resources is transferred. It is supposed to account for the technical, commercial and institutional management of the rural fire wood markets. Therefore,

LMS is of concern in all aspects of management and exploitation of forest resources, respect of rules and regulations in wood cutting, the tax levy, forest restoration and realization of social actions.

### *2.5.2 Forest Management Plan (FMP):*

The Forest Management Plan is a land use planning document for forest exploitation developed by the actors involved in the management of forest resources under the supervision of the Forest Administration. It is a working tool that includes technical, administrative, economic, fiscal and social measures for the sustainable exploitation of the forest resources in accordance with the National Legal Framework. It serves as a tool to set out strategies and objectives to be achieved in the context of sustainable use of forest resources for a given period of time by the use of prescriptions specifying targets, action and control arrangements.

### *2.5.3 Rural wood market*

A rural wood market is an organized place where local management structures have been installed for the management and exploitation of wood for energy in a given forest area for commercial purposes to supply large urban areas in Niger. They are established based on the provisions of the law, especially ordinance no. 92-037 which specifies the organization of marketing, transportation of wood and the subsequent taxes that are applicable. There are two types of rural wood markets in Niger based on the type of forest exploitation system, the organized markets, or controlled and oriented markets, and the non-organized rural wood markets, or uncontrolled rural wood markets.

#### *2.5.3.1 Controlled rural wood markets (CRM)*

In this type of rural wood market, forest exploitation is controlled and the operation is supposed to be organized through a management plan. They are supplied from a demarcated and developed or managed forest area. The CRM exploits the dead wood as well as cutting green wood. An annual quota of exploitation is fixed, based on the possibilities of the forest types. This market operation requires sound knowledge and a mastering of site and stand growth parameters.

#### *2.5.3.2 Oriented rural wood markets (ORM)*

This is a type of rural market in which the exploitation is oriented to the collection of dead wood in a given forest, delineated but not yet developed or managed for exploitation. It is a transitional form before the controlled system, which takes into account the new forestry law of 2004. An oriented market does not have a management plan and is limited to the collection of dead firewood only. In the Torodi zone, 87% of the rural wood markets are oriented markets and more than 50% of the total wood markets are located in the Gourma ecological zone (Laoualy et al. 2004; Adamou & Garba 2011).

#### *2.5.3.3 Uncontrolled rural wood markets (URM)*

This type of market can be described as free or uncontrolled forest exploitation, characterized by a lack of rural wood markets and management structures for the exploitation of the resource. Even though this is an uncontrolled market there are some legal measures regarding exploitation, through an exploitation permit. The permit defines the quantity to be exploited and the materials to be used for exploitation and carriage of wood. The exploitation and the recovery of taxes are under the authority of the forest administration. Regardless of the legal

measures, these exploitations are mostly carried out, ignoring the rules, and the quantities of wood exploited through this type of operation are enormous. This type of exploitation is practiced in all the agro-ecological zones and constitutes a major obstacle to the preservation of forest resources.

#### 2.5.4 Tax system, distribution and uses

Taxes are levied on the transportation of wood and are based on the type of rural wood market and the distance from the exploitation site to the city of consumption of the product, as show in Table 1. The unit of payment is the “*Stère*” (stere) equivalent to 1 m<sup>3</sup> of stored wood. The payment is made directly at the sale site. The LMS takes their share directly before sending the rest to the forest administration. The remaining fund is shared among the municipalities, the forest administration and the State (National Treasury) (Ministry of Hydraulics and Environment 1996).

**Table 1.** Tax fees based on the type of exploitation and distance to the urban centre

Categories of market based on distance to the urban centre	Tax fees based on the type of rural wood market (F.CFA)*	
	CRM	ORM
<b>Cat.1:</b> distance less than 40 km	350	375
<b>Cat.2:</b> distance between 40 to 80 km	315	340
<b>Cat.3:</b> distance more than 80 km	300	350

**1000 FCFA= 2.05 \$ USD, source:** (Ministry of Hydraulics and Environment 1996)

To regulate and organize the use of the fund of each beneficiary, the fund is divided into two categories. The first category is allocated for forest management called Forest Management Funds (FMF), and the second category is allocated for local development called the Village Development Fund (VDF) for the village and the Municipality Development Fund (MDF) for the municipality. The use of the development funds is at the discretion of the beneficiaries, the village in the case of the VDF and at the discretion of the municipality for the MDF.

The Forest Management Fund from the village is dedicated to forest protection and control, forest restoration and capacity building of the local structure of management, wood cutters, and members of local organizations acting in local forest exploitation. The use of these funds by the LSM is done through elaborated operational fact sheets developed with the support of Local Forest Services. This approach is of pedagogical importance, in the sense that it teaches rural populations the ideas of programming and implementation of investments of the local resources (Adamou & Garba 2011). The Forest Management Fund from the Municipality in turn is used to support the Local Forest Services in the supervision, monitoring and control of the forest operation and illegal activities. It is also used for local forest road restoration, and control of local wood marketing by the LMS (Ministry of Hydraulics and Environment 1992; Ministry of Hydraulics and Environment 1996). The mobilization and the efficient use of the funds are therefore crucial to ensure the sustainability of the system.

The share of the State is transferred to the National Treasury, and 60% of the share goes to the National Account while 40% is transferred to the Forest Control Account created for forest protection, equipment and training of forest rangers assigned for forest protection and all other expenses for nature protection. This account is also credited with 40% of all transactions of natural resources and forest products (Ministry of Hydraulics and Environment 1992).

## **2.6. Implication for livelihood improvement**

Rural wood market exploitation provides the local population the opportunity to gain new revenues and contribute to the improvement of the living conditions of the village communities. This is done through many socio-economic investments and social assistance by using the village development fund. The investment includes water supply, construction and maintenance of roads, schools, health care centre, etc. (Adamou et al. 2007; Adamou et al. 2009).

Apart from the local investment, local people generate larger income from employment, exploitation and sale of the wood and non-wood products (Garba 2001; Oksanen & Mersmann 2003; Inoni 2009). Many micro-enterprises were developed around forest wood exploitation and sales in the rural, urban and semi-urban areas in general (Laoualy et al. 2004; Adamou et al. 2007). This increases household revenues and reduces people's vulnerability to food shortages and seasonal shock (Oksanen & Mersmann 2003; Sunderlin et al. 2005). This can also lead to poverty reduction and increased household stability (Sunderlin et al. 2005). By ensuring continuous revenue and income, the rural wood market system is seen as a dynamic process toward local development and a way to sustain local democracy (Adamou & Garba 2011).

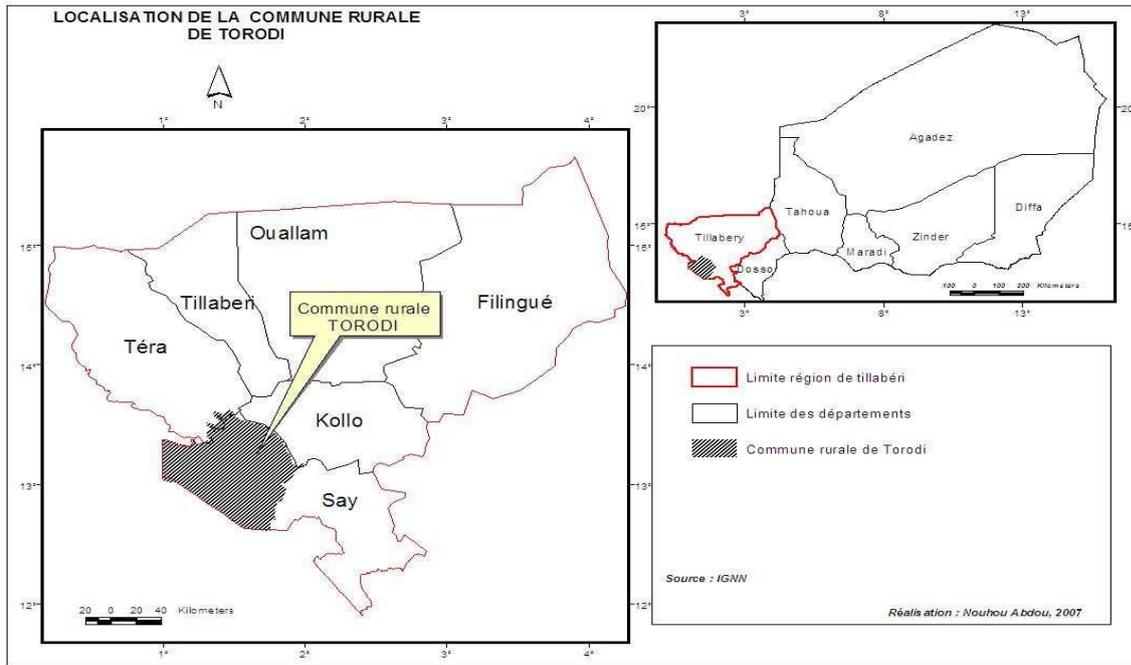
The present study looked at the way local people are managing the communal forest through the rural wood market system, to see the implication of forest exploitation to forest resources sustainability. Sustainability indicators are used to assess the community forest management.

## **3 METHODS**

### **3.1 Study areas**

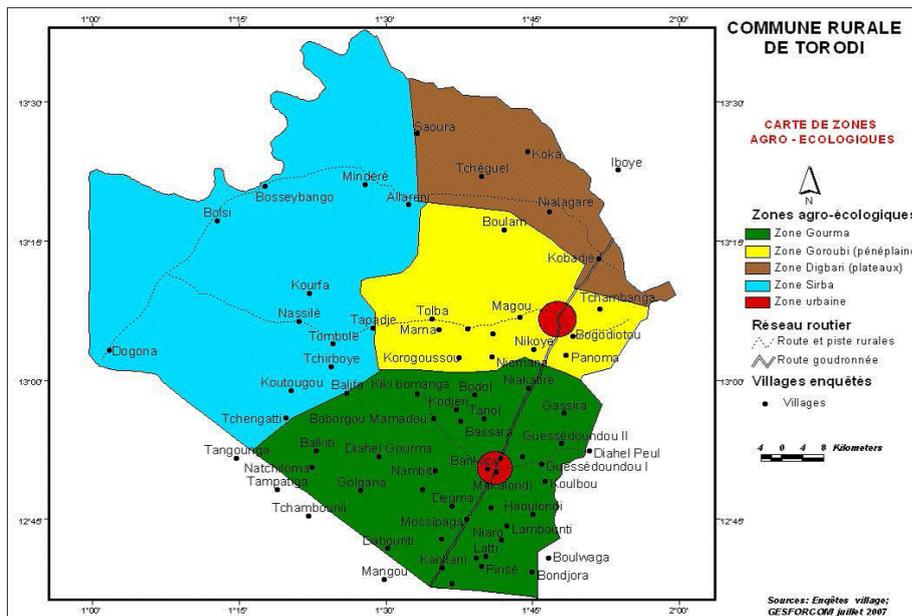
This study was conducted in Torodi Department, Tillaberi Region in the South-Western part of Niger Republic (Figure 1). The main town of Torodi is located 60 km from the capital city Niamey on the national road linking Niger to Burkina Faso. The Department of Torodi covers a land area of about 700,000 ha, of which 335,000 ha are forest woodland. The total population was estimated in 2012 at about 190,000 inhabitants (National Institute of Statistics 2013).

In terms of forest resources management, Torodi hosted the first pilot program in 1989 with the creation of the Faira cooperative, a World Bank project for the management and development of local forests (Gerald 1997). Wood is the forest product that generates the highest income to rural populations through the exploitation of rural wood markets. A total of 62 rural wood markets, distributed into four ecological zones (Figure 2), with their Local Management Structures (LMS), are supplying 80% of the firewood consumed in the capital city Niamey and its surroundings (Abdoul-Aziz 2008; Adamou & Garba 2011).



Source: (Abdou Nouhou, 2007).

Figure 1. Torodi position in Niger and Tillabéri region



Sources: (GESFORCOM, 2007)

Figure 2. Map of Torodi showing the 4 ecological zones

Torodi constitutes the remaining zone in Niger where 48% of the area is woodland. However, according to a study carried out by Project LCBFM in 2007 these resources are under high deforestation pressure for agriculture, firewood gathering and grazing. Around 43% of the woodland areas are encroached for agricultural activities (Abdoul-Aziz 2008).

### *3.1.1 Administrative and social organization*

Torodi changed from an administrative district under the Say Department in the Tillaberi region to a Department in 2011. In 2009, under ordinance no. 2009-03 creating the municipality of Makalondi, Torodi Commune is divided into two municipalities: the municipalities of Torodi and Makalondi. Makalondi hosts the largest number of rural wood markets in the Torodi zone, 39 rural wood markets out of 62, representing 63% of the total number of wood markets in Torodi (Adamou et al. 2009). The leaders in both administrative and social organizations are democratically elected. Agriculture is the main economic activity, and is totally dependent on climatic conditions. Livestock rearing constitutes the secondary activity. It is practiced both by men and women. Torodi is a trans-boundary zone for grazing where local herders and herders from neighbouring Nigeria, Burkina Faso and Benin come across for grazing.

## **3.2 Research methods and data**

The data for this study were derived from multiple sources, ranging from data collection tools such as questionnaires, reviewing literature materials, interviews, and direct observations (Kenneth & Bruce 2005). Primary data were collected in the field through focus group questionnaires and field observations. Each questionnaire was conceived based on the group of actors to be investigated. For the Local Management Structures and women's groups, in the village, a semi-structured questionnaire with open questions was used to collect information, while the municipal authorities and forest administrators received restricted questions and few open ended questions to acquire more views from the respondents.

A sample representing 10% of the rural wood markets corresponds to seven LMS was used. These selected LMS are distributed over the two municipalities. They consist of two controlled market in the Torodi commune (Nikoye and Panoma) and five oriented markets in the Makalondi commune (Banteri, Djandjanjori, Mossipaga, Mangou and Niakatire).

The data were collected by officials from the Direction of Forest Management and Land Restoration. Two teams were organized for data collection with one supervisor with the role of supervising the data collection, verifying and correcting the information reported and entering data directly in an elaborated excel sheet. All the organization of survey and data collection was done under the direct supervision of the Director of Forest Management and Land Restoration who also provided logistical support and organized the field missions to Torodi. The data collected were entered on an elaborated excel sheet from the field and then sent to Iceland for analysis.

In each village the surveyor organized a group discussion, regrouping the 10 members of the Local Management Structure, the village chief, the members of the federation of the rural wood markets and others resource persons. Because of some cultural barriers and in order to allow women to express themselves freely, a group composed solely of women was organized after each village meeting. After the village meeting, other meetings with the municipal authorities of Torodi, Makalondi (the Mayor and the Receiver), the Makalondi Forest Service and the Departmental Director of Environment of Torodi were organized. This was to investigate their role in monitoring, conflict management and law enforcement in rural forest exploitation, the respect of rules and regulations in wood cutting and realization of forest restoration, the distribution of revenue and uses. Interviews with local authorities also helped to capture other missing information from Local Management Structures. This information was complemented by a collection of experiences, testimonies

and stories from the beneficiaries, forest officers, the local control agents engaged by the municipalities and other actors and stakeholders involved in wood exploitation in Torodi Department.

### **3.3 Data analysis**

Data were analysed using descriptive statistical methods with excel and the statistical package for social science studies (SPSS) tools. The classification of results and discussion was based on the assumption that community forest management is sustainable if:

- The management approach is participatory, takes into account the interest of all stakeholders and gender balance, and maintains the forest condition.
- The exploitation of the forest for firewood respects the rules and regulations set by the management plan to maintain the ability of the forest to regenerate successfully.
- The exploitation of the local forest benefits the local community.
- The revenues allocated for forest management are sufficient and used to maintain the condition of the forest.
- The community has a positive attitude towards forest exploitation in the Torodi district.

The results are presented in the form of tables using multiple criteria decision approaches for sustainability in forest management, combining ranking and rating methods as described by Mendoza & Prabhu (Mendoza & Prabhu 2000; Roger et al. 2008). The method analyses the decision elements based on their perceived importance. The decision is satisfactory if its frequency is greater or equal to 50% (Mendoza & Prabhu 2000).

### **3.4 Constraints and limits of research**

The time frame of this research was very short and constituted a limitation that did not allow any depth on some issues and subjects of high importance. However, the contribution brought by the forest officers, the local monitoring agents and members of the Federation of Rural Wood Markets, the Federation of Wood Loggers and other beneficiaries helped to improve the quality of the information here reported.

## **4 RESULTS**

### **4.1 Management of community forest resources and rural wood markets**

The assessment of the management and exploitation of local forest and rural wood markets in Torodi Department was done using a sample of 7 communities involved in community forest management. Two indicators were used: a) the institutional framework and b) governance of local resources. The variables used to measure such indicators were: the validity of the Management Plan, the availability of other management tools such as the Forest Management Scheme and the Land Commission for Conflicts Management, and the functionality of the Local Management Structure (LMS). The LMS efficiency in financial resources collection and management, and the management approaches used for the governance of the local forest resources were also used. The quality of local governance was measured using the nomination of the local structure leaders, the information sharing and flow among stakeholders, the level of participation by women and the use of adequate fund raising and keeping tools and conflict management.

#### 4.1.1 Management approach for the governance of the local forest

Table 2 and Table 3 show results from measurement and assessment of the management indicator for sustainable exploitation of the local forest and rural wood markets in Torodi Department. Table 2 presents the institutional indicators, while Table 3 presents the indicators for good governance of local resources.

The results in Table 2 show that 43% of the LMS assessed were running their activities without a management plan and 57% of them were using an outdated management plan that expired in 2013. None of these structures had a forest advisor for sustainable forest exploitation. The forest officer explained this by the low number of forest staff and would be soon sorted out with the recruitment of a thousand forest staff. However, there are other management tools such as the forest management scheme (FMS) which established a diagnosis of the forest resource, the sustainable exploitation and the role of different stakeholders. There is also a Departmental Land Commission for Conflict Resolution (DLCCR). In addition, results showed that 57% of the LMS inventoried declare having a Local Land Commission for Conflict Resolution (LLCCR). These institutional bodies are good regulators in local forest management. The results also showed that 30% of the Local Management Structures were not working, either because of overexploitation of the forest resources or by mismanagement of the LMS.

**Table 2.** Institutional management indicators

Criteria	Indicator	Utilities	Results (%)
The institutional frame allows sustainable management of resources	Proportion of rural market using a valid management plan (MP)	No Management Plan	43
		Management plan not valid	57
	Existence of other management tools in the locality	Forest Management scheme for the commune	yes
		Communal land commission for conflict management	yes
	Proportion of village with local land commission	Have local land commission	57
		No local land commission	43
Proportion of functional local structure of management (LSM)		Functional	70
		Not functional	30
	Proportion of LSM having a forest advisor (FA)	Have a forest advisor	0

The results in Table 3 show that in 57% of the LMS lack good governance of the resources as a few influential people have monopolised the local structure for years without any democratic alternation of leadership. There is little or no flow of information between the LMS and the villages about the management of local markets. This was confirmed during the village meeting where the exchanges on the financial issues resulted in a greater debate on the figures advanced by the members of local structures. The gender balance was also maintained in 71% of the LMS. Women were involved in rural community forest management even though the number of women implicated in the local structure and decision making was very low. Only 14% of the LMS had more than one woman on their committee. About 71% of the LMS declared they had a good system of fund raising and managing. However, only 14% were declared by the forest administration and municipal authorities to have good use of the fund raising tool while 43% and 42% of the LMS were declared to be satisfactory and not satisfactory, respectively. The results indicated 86% of the LMS declared they had a

good relationship with forest and local authorities and were able to solve their conflicts or have no conflicts on resource uses.

**Table 3.** Governance indicators

Criteria	Indicator	Utilities	Results (%)	
Local Management Structure(LMS) apply the basic principles of good management and good governances in forest resources exploitation	Proportion of LMS using participatory and democratic approach and renewing their LMS	Renewing LMS on time	43	
		Not renewing LMS	57	
	Proportion of LMS Sharing Management information	Good information flow	43	
		Lack of information flow	57	
		Level of women participating	LMS with no women	14
			LMS with one woman	71
			LMS with more than one	15
	Proportion of LMS using adequate tax collection and fund management system	Had problem in fund management	29	
		No problem in fund management	71	
	Use of fund raising tools for forest management	Good	15	
Satisfactory		43		
Not satisfactory		42		
Exploitation of resources is done in a low conflict environment	Proportion of rural market with/without conflict	Have conflict	14	
		No conflict	86	

#### 4.1.2 Management approach to maintain the local forest condition

Table 4 presents the management approach to maintain the condition of the forest. The variables used were forest integrity, respect for the rules and regulations set for sustainable exploitation and the actions taken to maintain the capacity of the forest to regenerate and continue to provide the goods and services required.

The results showed that more than 57% of the forest contains signs of agricultural activities in the form of scattered active farming (43%) or old fallow (14%) as shown, in Figure 3. The respect for rules and regulations in forest exploitation was non-existent in most of the community forest.

Less than 30% of the LMS respect the regulations. The actual condition of the forest ranged from much exploited (43%) to overexploited (57%) and there was no forest area in good condition as, shown in Figure 3. The Local Management Structures in 57% of the cases declared that the forest regenerates less than before, while 29% thought that forests regenerate more than before and 14% declared no change. The results in Table 4 also showed that 71% of the local markets were closed either due to overexploitation or to the outdated Management Plan. However there was a great concern for forest restoration by all the LMS (100 %), even though some declared that the fund for forest management was not sufficient to overcome the forest degradation as their rural markets were not functioning effectively.

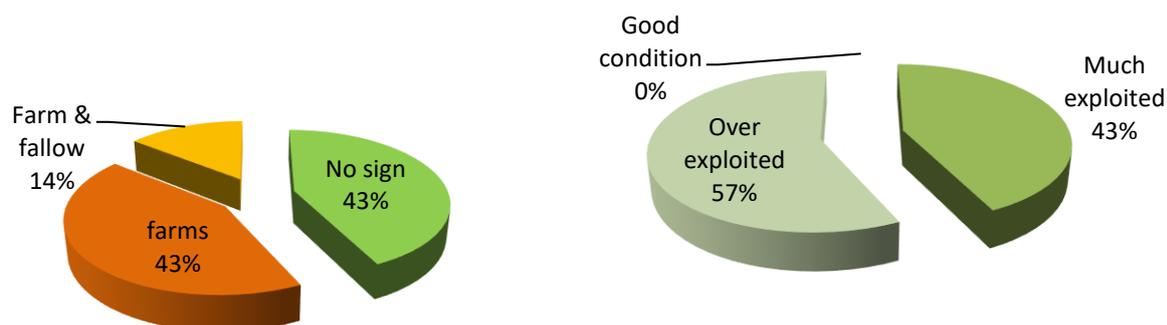


Figure 3. Actual situation of the Torodi community forest

**Table 4.** Indicators for sustainable management to maintain the condition of the forest

Criteria	Indicator	Utilities	Results (%)
Respect for the integrity of the forest	Proportion of forest with no sign of agricultural activities	No sign of agriculture activities	43
		Farms	43
		Farm & fallow	14
	Proportion of community forest with no clear cutting	Respect forest integrity	29
		Not respect	57
		Partially respect	14
The condition of the forest is maintained to ensure its regular regeneration	Proportion of LMS doing restoration activities	Doing restoration	100
		No restoration	0
	Sufficiency of restoration fund from rural wood markets for restoration	Sufficient for restoration	71
		Not sufficient for restoration	29
	Proportion of the focal structure that maintains good forest condition	Good condition	0
		Much exploited	43
Over-exploited		57	
Forest regeneration	Regenerate less	57	
	Better than before	29	
	As before	14	
Proportion of rural market closed due to over-exploitation	Closed due to over-exploitation	71	
	active	29	

#### 4.2. Respect for regulations in forest exploitation

The sustainability in forest exploitation is measured using indicators such as the respect of the integrity of the forest and the forest block or forest management unit and the respect of principles in tree cutting and the period of forest exploitation.

The results in

Table 5 showed that more than half of the Local Management Structures did not respect the integrity of the forest block or forest management unit. The design for the species to be cut was not respected either. The community forest management plan recommended that only species for firewood be exploited in the Torodi forest to supply the rural market. These species were: *Guiera senegalensis*, *Combretum nigricans*, *Combretum glutinosum* and *Combretum*

*micranthum*. The observations on the field and in the rural wood markets revealed that other species such as *Anogeissus leiocarpus*, *Balanites aegyptiaca*, *Diospirus mespliformis*, *Tamaridus indica*, *Bombax spp* and *Khaya senegalensis* not designed to be cut were in fact being cut and were present in the stored wood. The designed cutting diameter and height were not respected either in 80% of the cases. The results showed that respect for management practices was not high, and only 29% respected the designated species requirements, 14% respected the diameter cut, and 15% respect the planned height. Nor was the exploitation period respected in more than half of the Local Management Structures.

Villagers justified the failure to comply with the forest block by the difficulty to control wood loggers, the inadequate demarcation of the forest block, and the scarcity of resources in some forest blocks. As to respect of the designated species and the period of forest exploitation, the LMS noted the preferences of the buyers which are based on the calorific value of the tree species. The LMS also noted pressure from their customers. According to the president of the federation of rural wood markets, the high demand for wood occurs during the rainy season, its price increases and it becomes scarce. This makes wood transporters and buyers from the city arrange illegal exploitation in remote forest areas with the wood loggers and some corrupted LMS member.

**Table 5.** Criteria for sustainable forest exploitation

Criteria	Indicator	Utilities	Results (%)
Respect for the integrity of the forest	Proportion of community forest with no clear cutting	Respect forest integrity	29
		Not respect	57
		Partially respect	14
Exploitation respecting the rules and regulations set for the community forest management	Proportion of rural markets that respect exploitation principle	Respect designated species	29
		Partially respect the species	71
		Respect diameter of cut	14
		Partially respect diameter of cut	86
		Respect height to cut	15
		Partially respect height	85
		Respect block limit	15
		Partially respect block limit	14
		Not respect block limit	71
		Respect exploitation period	29
Respect partially	57		
Do not respect	14		

The principle driving the community forest exploitation divided the managed forest area into two or three forest blocks. Each block to be exploited was based on an annual quota for three years. If the exploitation is carried out respecting the forest blocks and the rotation period for each block, it will take 6 to 9 years to be able to return to use of the same forest block. This allows forest regeneration to take place and to obtain maximum exploitable tree diameters and height. It also improves the sale cost of the wood. However the results from the field observations showed that in 29% of the LMS that respected the integrity of the forest block, there was a decrease in the diameter of cut but an increase in the number of exploitable wood stems.

#### 4.3. Revenues and other benefits of forest exploitation on community development

The sustainability of forest exploitation for community development is measured using socio-economic indicators for sustainability. These indicators include: the revenue generated by the local community through forest exploitation (tax levies, income, and employment), the social investment in the villages and other individual benefits to the community.

4.3.1. Tax system, distribution and uses

Figure 4 presents the distribution of taxes among beneficiaries, based on the type of rural wood market. In the controlled rural market, 50% of the taxes were attributed to the Village, 40%, to the Municipality and only 10% to the Government or National Treasury. In the case of oriented markets, 30% was allocated to the Village, 20% to the Municipality and 50% to the Government. In the uncontrolled market system, the taxes were shared between the Government (90%) and the Municipality (10%). It appears from such a distribution that, in the local management system, 90% of the revenue is turned over to the local communities, the village and the municipality in the controlled system and 50% in the oriented system. On the other hand, where there is no intervention by the local people in the forest exploitation (uncontrolled exploitation) only 10% of the revenue goes to the local community (Municipality). According to the Departmental Director of Environment, this is done in order to raise awareness in the local community for the management of their local resources, and to own the forest and protect it against illegal exploitation for their sustainable development.

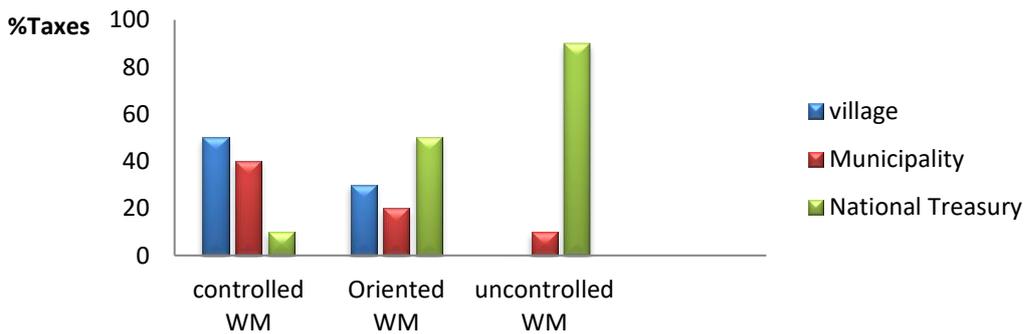


Figure 4. Taxes distribution among beneficiaries based on the type of rural wood market (WM)

Figure 5 and Figure 6 show the partition of the share of beneficiaries in the oriented market system (Fig. 5) and in the controlled market system (Fig.6). The results showed that 60% of the revenue in the local community was allocated to forest management activities in the oriented market system, while only 40% was dedicated to forest protection in the controlled market system and 60% in this system dedicated for local development. This shows how reform is supporting local commitment for development through sustainable use of local resources.

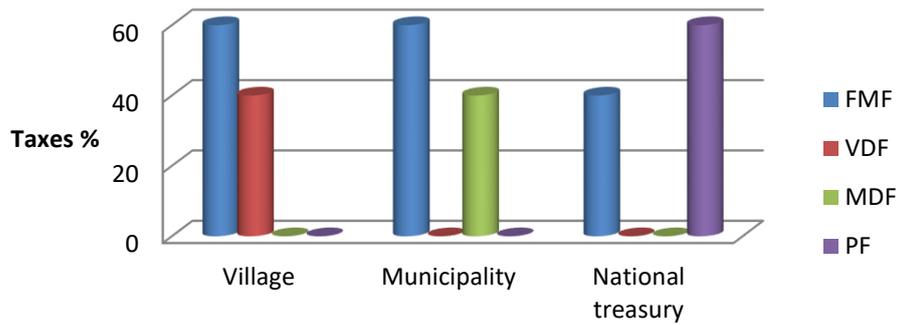


Figure 5. Uses of the shares allocated to each beneficiary in an oriented market system

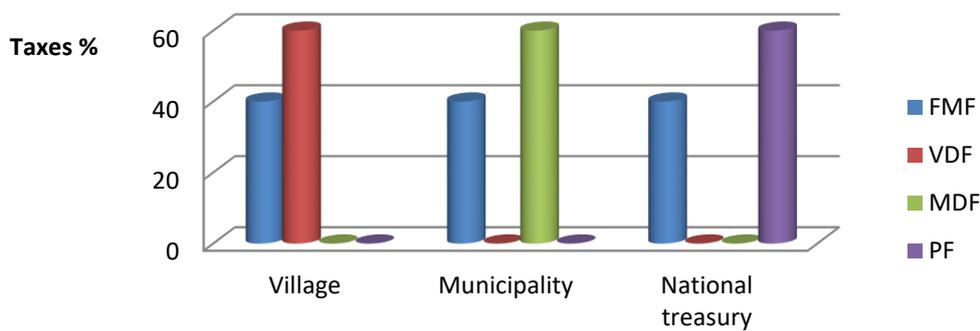


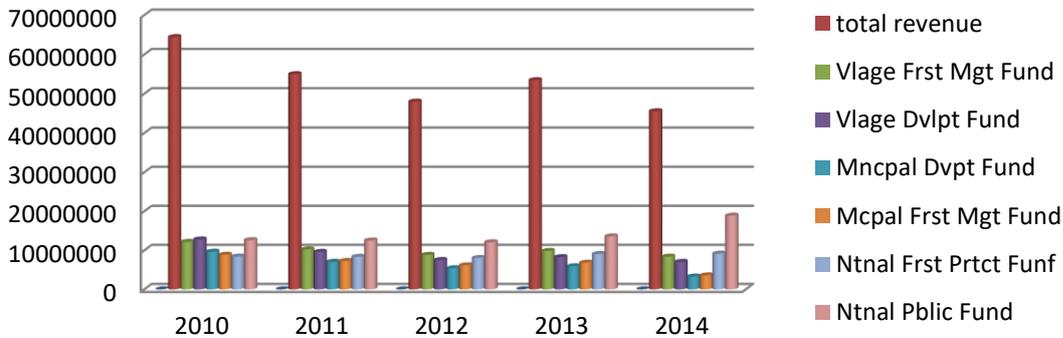
Figure 6. Uses of the shares allocated to each beneficiary in a controlled market system

#### 4.3.2. Local revenues and the social investments.

Figure 7 shows the amount of tax revenues collected during the last five years by the LMS and its distribution and allocation for investment among beneficiaries. The collected taxes varied greatly. The mean tax ranged between 45.5 million to 54 million FCFA each year. The local development fund and the forest management fund were also variables and depended on the amount of taxes collected. However, they varied from 8 to 12 million a year, as shown in Figure 7. The lowest amount of taxes and the lowest fund allocated to the local community was recorded in 2014, while the amount allocated to the national public fund increased significantly. A higher tax recovery was however observed in 2010 because of the intervention of the project GESFORCOM, and a small rise in 2013. The low tax revenue in 2014 was the result of mismanagement in many rural markets and lack of control of illegal exploitation. This also showed that the LMS did not have enough control over the exploitation of their forest and that there was illegal exploitation controlled only by the forest officer at the main control point. Another factor explaining this result is the fact that all the controlled wood markets were closed due to the lack of an updated management plan and overexploitation of forest resources.

Figure 8 shows the social investment by local community from the village development fund. The investment concerned the education, health and water sectors. In the education sector, 67% of the resources were used in the renovation of the school, including buying furniture and school equipment, while 33% of the fund was used for the construction of

new infrastructure. In the health sector, 77 % of the fund was allocated to supply the local health care centre with medicine and for buying animal drugs and vaccination against diseases; 23% of the fund was used for the maintenance of the healthcare centre or the cost of urgent evacuation of the villagers to urban health centres. The same situation was observed in the water quality improvement; 67% of the resources were used to restore all water sources and 33% used for new sources.



Sources: Field data from Departmental office of Environment and Forestry, Torodi 2014

Figure 7. Tax revenues collected and their allocation for the last five years

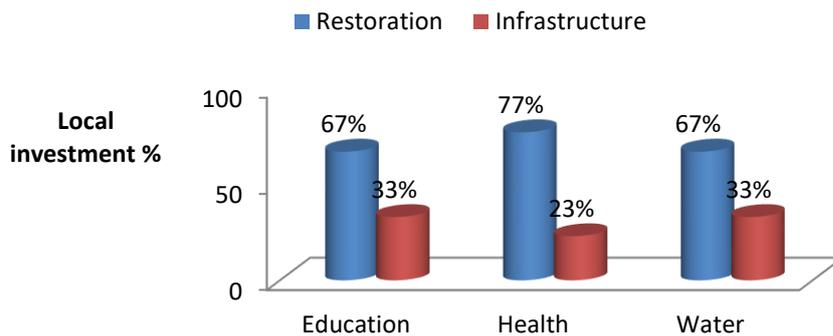


Figure 8. Social realisation by the local community

#### 4.3.3. Other revenues generated from forest exploitation

Revenues from the collected taxes represent only 10% of the total revenue generated from community forest exploitation. The taxes depend on the price of the wood, which can change according to the period of the year. During the dry season the price of a “stere” of wood was 1550 FCFA while it cost up to 2000 FCFA during the rainy season. A total of 80% of the revenue from the exploitation went to the local exploiters; wood loggers, wood sellers and those intermediate in the wood business, as shown in .

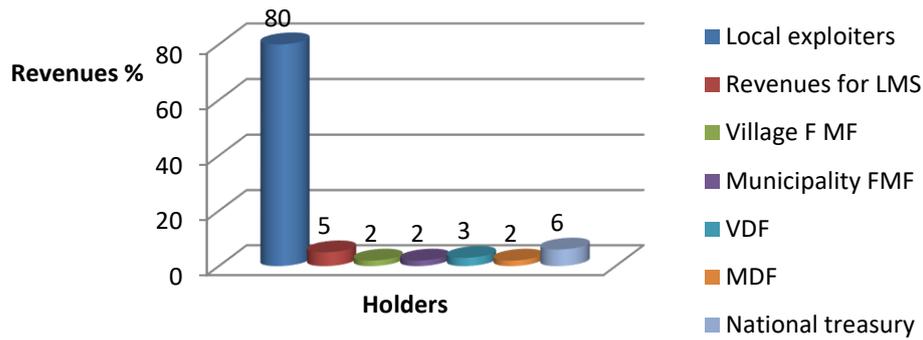


Figure 9. Distribution of the revenue from wood exploitation among stakeholders

The villages unanimously recognised that the community forest management has created many opportunities. Apart from the investment from the village development fund in education, health and quality of water sources, they had enough cash from logging activities, the wood business, and cash or assets from forest restoration activities. These had allowed them to satisfy their family needs and even make some investments. Women in the villages mentioned the small grant initiated by the project GESFORCOM with the revenues from forest exploitation during the project intervention and they still benefited despite the end of the project. The grant consisted of cash given to the poor households to start a business or buy a set of goats for women to rear for a period of time, as show in Figure 10. After the goats delivered once or twice, the women took the small kids and handed over the mother goat to another woman in another household. The initiative was much appreciated by women as a way of economic empowerment of local women. Among other positive impacts was the employment of local people as local forest controllers the activities reserved only for foresters before (see Figure 11). The reduction in emigration, the empowerment of poor households, the increase in food security with the creation of a bank of cereals and livestock food, the strengthening of social cohesion through marriage and social assistance were other beneficial implications of the community forest management project.



Source: GESFORCOM 2007.

Figure 10. Goat distribution to women in Torodi village



Source: GESFORCOM 2007.

Figure 11. Torodi local forest controllers equipped with motorcycles

#### 4.4. Forest management fund and forest restoration

The results in Table 6 show the proportion of the tax revenues from each stakeholder allocated to forest management, or 40% in the controlled market system and 60% in the oriented market

system from the local communities (the village and the municipality). The village forest management fund is dedicated not only to restoration activities, but also for capacity building to empower local forest resources managers and other local actors for the conservation of the forest resources. It was observed that in all the Local Management Structures this fund was only used for plantation and physical restoration. There was no capacity building for the local actors. The municipality forest management fund in turn is dedicated to support local forest service in the protection, supervision and control of all actions in forest protection and conservation.

**Table 6:** Revenues allocated to forest management from the share of stakeholders

Stakeholders	Controlled Rural Market (%)	Oriented Rural Market (%)
Village share	40	60
Municipality	40	60
National treasury	40	40

However, the mobilization and utilization of the fund from the municipalities faced several problems including accessibility and their investment in forest protection and conservation. According to the Torodi Municipality fund receiver, this was due to the process by which the fund transits around before reaching the municipality. If in the case of the LMS it is a direct levy, in the case of a municipality, the funds transit from the LMS to the Local Forest Controller (LFC). The LFC in turn makes the payment to the Departmental Director of Environment (DDE) who centralizes the entire fund from the rural wood market before sending it to the regional taxes collector at the regional office of Tillaberi. Progressively, the fund passes through the State Cashier and the National Treasury. From the National Treasury, it follows the same cycle until the Regional Cashier before reaching the municipality account. It is the same situation with the forest protection fund, an account at the national treasury, for which the supply and monitoring mechanism deserves to be improved. Indeed, the flow and circuit of the funds to these accounts and the modalities for the calculation of the amounts to be paid did not appear too favourable to most of the actors in the chain, making it difficult to track and make good planning for their future investment. *“Most of the time, they receive half of the expected amount and the designation does not specify and differentiate the FMF and the MDF. This even creates conflict between the municipality and its partners, especially the Federation of Local Wood Transporters and the local wood market,”* said the Major during the interview.

The consequences of this difficult access to the funds are the low commitment of the municipality in the supervision and monitoring of rural markets, the low level of investment in the restoration and protection of the local forest, and the low level of assistance to the forest officer for the control and protection of the forest against illegal exploitation. It also affects the level of taxes recovered because of the low participation of the municipality in tax collection and control of wood transaction.

#### **4.5. Perception of the local community on the exploitation of forest resources in Torodi**

More than 85% of the LMS underlined the importance of the exploitation of the community forest to their living condition as it has increased their revenues, has reduced rural exodus and increased employment and social investment. All the interviewed communities noticed a great achievement due to the local forest resources management. They underlined, among others, the reduction of women’s domestic duties, the easy access to forest products and the increasing value of the forest products. One positive aspect of the community-based resources management frequently mentioned by all the communities visited was the social cohesion and conflict resolution among resource users. Torodi is a place with a

multicultural background where the communities have different perceptions of forest uses. However, different communities did come together to manage common forest areas: *“We are able to set and resolve many of our conflicts. Traditional farmers, Fulani herders and traditionalist Gourma hunters, we all agreed on the principle of management and we are highly benefiting from it,”* said the local leader in Makalondi.

However, 15% of the communities are reluctant to exploit the forests. They underlined some conflict between forest exploitation and other land use systems such as agriculture and livestock production, the reduction of forest resources other than wood and the low regeneration of the forest and degradation of pasture and other land potential. This group thought that with the population increase and the degradation of the agricultural and pasture land, they needed to secure more land for their future.

The local communities unanimously recognized their total implication in the management of their local forest resources, as mentioned by the president of the federation of rural wood markets. *“One of the highlights and commitments of this reform is the responsibility given to rural communities, particularly in the controlled or oriented exploitation system, a task previously exclusively reserved for the forest services,”* he observed. According to the Torodi Director of Environment, the perception of the taxes by the Local Management Structure for the benefit of several beneficiaries, including the State, constitutes significant progress in the empowerment of local communities for the sustainable management of forests. This provision created a moral obligation to these communities in the maintenance of the local forest resources.

## **5. DISCUSSION**

### **5.1. Management of the community forest resources and rural wood markets in Torodi**

Results from the institutional management indicators showed that the management of the community forest resources was currently not working well due to different institutional constraints. At the time of this study all the local structures of management were running their activities without an updated management plan. The set-up of the community resources management in general and forest resources in particular should always be accompanied by a management plan accepted by all stakeholders involved in the resources management (Carlsson & Berkes 2005). The non-updating of the management plan showed that the forest resources were managed in an institutional frame where the sustainability of the resources cannot be guaranteed, especially in a context of resource scarcity and conflict in resources use (Abolina & Luzadis 2013).

The Local Management Structures, furthermore, are working without any forest advisor who can give them directives for a sustainable exploitation of the forest. This has a significant impact on the forest exploitation, tax collection, the often lack of respect for rules and regulations in the exploitation and management of the rural wood markets as well as the democratic governance of community forest resources and conflict management. This is exacerbated by the fact that local people have limited knowledge about the forest ecological functions and the economic theory of management. Therefore, to link the ecological vision to economic and social vision, the application and development of such knowledge is fundamental for the sustainable management and exploitation of community forest resources (Fraser et al. 2006). The lack of a forest advisor can be related to the general shortage of capable forest officers in the country. However according to the Departmental Director of Environment, this situation will soon improve; the Ministry of Environment has recruited thousands of personnel of whom

a large number will be deployed to Torodi, as it is a department with a high forest potential. The municipalities noted also the presence of some local forest controllers recruited to assist forest controllers in the supervision and monitoring of the rural wood markets and the forest exploitation.

#### *5.1.1. Management approach to governance of the local forest*

The assessment of the quality of management showed that the local forest management by the LMS was still very poor, as had been found in the study by GESFORCOM in 2007, as there was no democratic governance in almost any of the Local Management Structures. A few influential people monopolized the local structure without any change in leadership. There was little or no flow of information between the management committee and the village concerning the exploitation of the forest and the management of rural wood markets. This was confirmed during the village group meeting where the exchanges on the management issues, especially financial, resulted in a greater debate on the figures presented by the LMS. However, there had been progress in the engagement of women in the management system compared to the investigation in 2007 by GESFORCOM, when the proportion of the local structure without women was 45% while, during this study, it was 14% (GESFORCOM 2007). The lack of control of wood cutters in forest exploitation was also underlined in almost all the LMS during the interviews. This has had a negative impact on most rules and regulations in forest exploitation. The lack of good participatory approaches and good leadership has resulted in the mismanagement of the local forest resources, the misuse of funds, low taxes collected and conflicts among local users, the overexploitation of resources, and encroachment and transformation of forest areas to agriculture land. The management systems in most of the LMS have failed to control the illegal exploitation of the forest resources, and the overexploitation of the forest and other management problems have resulted in the closing of many rural wood markets.

Despite this, the management and use of resources was quite satisfactory in 1/3 of the local structures. They have good use of the funds and have made good investments in the village and restoration of the forest. However, there is still more to do in the use of fund raising tools, which has not been mastered by a numbers of local structures, and training in the management system.

## **5.2. Forest exploitation**

Forest exploitation is generally carried out regardless of the limits of the forest unit and the rotation unit. This is due to the difficulty in controlling loggers, and inadequate demarcation of forest limits, the scarcity of resources, the lack of sufficient training of loggers and local structures, the lack of awareness and the lack of monitoring by forest officers. Investigation revealed also problems in maintaining the integrity of the forest by the presence of agriculture farms. This was imputed to the village chiefs who distributed pieces of land to their inhabitants. They explained this by the increased population, the need for food for everyone and the scarcity of agricultural land. The decline in land productivity and the strategy to anticipate land detention has forced these populations to secure more arable land and exploit the delineated forest. There is, therefore, evident conflict between forest and other land use systems such as livestock rearing and agriculture.

Failure to comply with basic standards in forest exploitation was observed in all the Local Management Structures. The result has therefore been exploitation rather than controlled, efficient use of the forest potential. This was first explained by the low level of knowledge of cutting techniques, but also the low level of control of the wood cutters by the LMS. In some

villages, wood loggers are hired from outside for logging and these have had no training in wood cutting or the knowledge of rules and regulations governing forest exploitation. The second explanation is that wood cutting is directed by the preferences of the buyers which are based on the calorific value of the wood. This explains the overexploitation of some species such as *Combretum nigrican*, a species of high calorific value. This also explained the reason why oriented wood markets, which are directed only to the collection of dead wood, are involved in cutting fresh wood.

The period of forest exploitation was set from November to June, to allow forest regeneration during the rainy season. Also during this period, cut wood may be vulnerable to disease attack and may rot and die. To avoid such a situation, it is totally forbidden to cut wood during the rainy season. Investigation, however, revealed that exploitation is carried out throughout the year. This may affect forest regeneration.

### **5.3. The benefit of forest exploitation**

The socio-economic indicators measured, such as the revenues generated by the local communities, in terms of taxes and other income, the employment of local people and the value of local investments, showed a great contribution to the community forest management to the Torodi local community. The empowerment of women, the local control of forest resources and local governance in forest exploitation are other benefits from the community forest management. Other positive impacts of the community forest exploitation have been reduction in rural migration to urban centres due to the reduction in the level of youth unemployment and the empowerment of poor households with the increase in food security through the creation of community food stock reserves. The strengthening of social cohesion through social assistance has been another dimension of social sustainability noticed in community forestry in Torodi. As addressed by Moldan et al. 2012, the diversity of such economic, social and cultural conditions to improve livelihood constitute a pivotal point in the context of advancing sustainability and local development (Moldan et al. 2012).

### **5.4. Forest fund and forest management**

This study has shown that the Local Management Structures used the FMF only for tree plantations and physical restoration of the forests. Training and capacity building of the local actors, important aspects of local forest management, on the other hand, has been neglected. This has had a significant negative impact on the sustainability of forest resource protection and conservation. In the case of the municipalities, the accessibility of the fund impedes the realization of actions for the control, protection and restoration of the local forest. All these actions have a great implication in promoting the sustainable management of the local forest, and the regeneration of the forest stocks.

### **5.5. Perception of the local community on the exploitation of forest resources in Torodi**

Torodi villagers unanimously recognized a great achievement obtained from community forest management through the rural wood market system. They have achieved some level of sustainability in household security and social cohesion. They also underlined an increase in their revenues, the empowerment of women, conflict resolutions and their total implication in decision making and management of their local forest resources. However, despite these achievements, and with regard to the actual situation of the forest, there are still many challenges. Forest sustainability implies integrated decision making to balance the economic

and social needs of the people with the regenerative capacity of the forest resources. This implies that the exploitation of the forest resources, the direction of investment, the orientation and use of technological development, and institutional change should be managed together to meet the present and the future needs of the local community (Pearce et al. 2013). Similarly, compensative action should strengthen environmental protection and development and lead to the rise of community welfare and improvement of the quality of life (Rinne et al. 2013). In the case of Torodi, even though there is some political will for decentralized management of the community forest, the lack of institutional and technical follow-up has set back the process of sustainability and development due to their inefficiency to intervene when necessary and beneficial for the local communities. The side effect is the overexploitation of the forest resources, the conflict among users and finally the end of the activities of the rural wood markets. This type of situation was revealed by Ghai and Vivian (2014) who pointed out the lack of institutional and technical support as the limiting factors for success in most government environmental projects (Ghai & Vivian 2014).

## **6. CONCLUSION AND RECOMMENDATIONS**

In the need to balance the demand for wood as an energy source with forest conservation, the Niger government has instituted a reform in forest policy to create greater accountability of the local community in the management of the forest resources. The reform is centred on the participatory approach using the community management system. Rural wood markets have been established with a new forest management practice, instituting tax levies on transportation and commercialization of wood from rural areas to urban. The levied taxes and other revenues are shared among stakeholders and allocated for forest protection and management, and local development. After 20 years of execution, the local community system approach has brought about a range of initiatives for rural community development. These include: economic empowerment, local responsibility in forest management, decentralisation of resources, and local governance. Nevertheless, this study has revealed some dysfunctions in the community forest management system. These issues are mostly technical and institutional and have significant implication on forest exploitation, forest governance and forest protection and management.

To promote sustainability in local community forest exploitation and for better accountability of the revenues from forest exploitation for local development, the following issues need to be considered:

- The management plans have to be renewed and set for all rural wood markets.
- LMS need to be assisted with forest controllers, for better forest management and respect of rule and regulation in forest exploitation;
- Good governance and gender balance has to prevail in the design of the local structure committee of management.
- The system for the allocation of the municipality forest management fund and the forest protection fund has to be reviewed for a direct access of such funds to the municipalities and forest service, for active forest control and monitoring of rural wood markets.
- Training sessions in forest resources governance, democratic resources management for LMS should be organized.

- Wood loggers and all local actors should receive training on the principle of forest exploitation and the importance of forest resources and community management to the local community.

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## APPENDICES:

### Appendices 1: Questionnaires for village group - local management structure

**Note:** the questionnaire is bilingual: French in bold and English in italics

**Fiche de collecte de données n° 1** (Data collection sheet N° 1):

<b>Généralités</b> (general information)
<b>Commune de Torodi:</b>
<b>Zone Ecologique</b> (Ecological zone) : 1 = Digbari    2 = Goroubi    3 = Gourma    4 = Sirba
<b>Nom du Marché Rural de bois</b> (Name of the wood rural market):
<b>Type de Marché Rural de Bois</b> (Type of wood rural market) O = Orienté (oriented)    C = Contrôlé (controlled)
<b>Espèces dominantes autorisé</b> (Dominant authorized species): <b>classez par importance</b> (Classified by importance) 1 2 3 4

**1. Information General sur la forêt/marché** (General information on the forest/ rural wood market):

<b>1.1. Depuis combien d'années exploitez- vous votre forêt/marché</b> (How many years have you exploited your forest/wood market) ?
<b>1.2 Avez-vous un plan d'aménagement</b> (Do you have a management plan) : 1= oui opérationnel (yes up to date)    2= Non (No)    3= Oui non opérationnel (not up to date)
<b>1.3 Avez-vous une Structure locale de Gestion (SLG)</b> (Do you have a Local Management Structure (LMS))? 1 = Oui (yes)    2 = Non (No)
<b>1.4 Votre structure est-elle active</b> Is your LSM actually active)? <b>1= Oui</b> (yes) <b>2 = Non</b> (No) Si Non depuis quand elle ne fonctionne pas (If No, since when is it not functioning)
<b>1.5 Pourquoi elle ne fonctionne plus</b> (If No, why is it not working)
<b>1.6 Continuez-vous à exploiter du bois dans votre forêt</b> (Do you still exploit wood in your forest) ? 1 =Oui (yes)    2= Non (No) si Non Pourquoi (if No, why not ?)
<b>1.7 Depuis que vous avez commencé l'exploitation de votre forêt comment comparez-vous sa régénération</b> (Since you started exploiting your forest, how do you compare its regeneration) 1= mieux qu'avant (better than before) 2 : comme avant (as before) 3 : moins qu'avant (less than before)
<b>1.8 Comment appréciez-vous l'Etat de votre forêt actuellement</b> (How did you assess the actual state of your forest)? 1= peu exploitée (low exploitation) 2 = très exploitée (much exploited) 3 = surexploitée (over-exploited)
<b>1.9 Existe-il de défrichement dans le bloc forestier</b> (Are there any signs of agricultural activities in your forest block) : <b>1= Oui</b> (yes) <b>2 = Non</b> (No) Si Oui les types d'occupation (If YES types)





## Appendices 2: Questionnaires for the Torodi forest administration

### Fiche de collecte de données n° 2 (Data collection sheet N° 2):

**Note:** the questionnaire is bilingual: French in bold and English in italics

(Pour l'Administration Forestière de Torodi (for Torodi forest administration))

<b>Généralités</b> (general information)
<b>1. Ya-il d'occupation illégal dans ces forêts ?</b> (Are there any illegal occupation in these forests?)
<b>Si Oui lesquelles</b> (if yes which type)
<b>2. Ces structures locales de gestion pratiquent-ils des actions de restauration</b> (Are the Local structure of Management practicing restorations activities?)
<b>Citez les types d'action de restauration</b> (list the type of restoration actions)
<b>3. a). Ces forêts sont-ils dotés des plans d'aménagement ?</b> (Do the managed forest have a management plan?) <b>b). Ces plans sont t- ils fonctionnel ?</b> (These plans are they up to date?) <b>1 =Oui</b> (yes) <b>2 = Non</b> (non)
<b>4. Existe-il des conflits dans usage de la ressource forestière</b> (Are there any conflicts in the use of the Common Forest resources): <b>1= Oui</b> (yes) <b>2= Non</b> (No) <b>a). Si Oui lesquelles</b> (If yes, type of conflicts) <b>b). Comment affect-ils la gestion de la forêt communautaire</b> (How does it affect the management of the community forest)?
<b>5. Combien de Structure Locales de Gestion ont des problèmes de délimitation de leur forêt</b> (How many Locale Structures of Management have forest delimitation problems) <b>Comment pensez que ces problèmes peuvent être résolus</b> (how do you think these problems can be solved)
<b>6. Comment appréciez-vous l'Etat actuel de ces forêts</b> (How do you see the actual state of these forests)? <b>1= peu dégradée</b> (low degradation) <b>2 = dégradée</b> (high degradation) <b>3 = très dégradée</b> (very high degradation)
<b>7. Dans l'exploitation des forêts est ce que les normes techniques prescrites sont respectées</b> (In the exploitation of the Forest, are the prescribed rules and regulations respected)? <b>1). Intégrité du bloc forestier par présence de défrichement</b> (the integrity of the forest blocks: clear cutting for agriculture): <b>1 = Oui</b> (yes) <b>2 = Non</b> (No) <b>3= passable</b> (somehow) <b>2). Espèces désignés</b> (designed species) : <b>1 = Oui</b> (yes) <b>2 = Non</b> (No) <b>3= passable</b> (somehow) <b>3). Diamètre de coupe</b> (cut diameter) : <b>1 = Oui</b> (yes) <b>2 = Non</b> (No) <b>3= passable</b> (somehow) <b>4). Hauteur de coupe</b> (cutting height) : <b>1= Oui</b> (yes) <b>2 =Non</b> (No) <b>3= passable</b> (somehow) <b>5). Limite des parcelles</b> (block limit) : <b>1= Oui</b> (yes) <b>2 =Non</b> (No) <b>3= passable</b> (somehow) <b>6). Période de coupe</b> (cutting period) <b>1= Oui</b> (yes) <b>2 =Non</b> (No) <b>3= passable</b> (somehow) <b>7). En général comment évaluez-vous l'exploitation de ces forêts en termes de durabilité</b> (In general how would you rate the exploitation of these forests in terms of sustainability?) <b>1 = non durable</b> (not sustainable) <b>2 = peu durable</b> (little sustainable) <b>3 = durable</b> (sustainable)
<b>8. i). Est-ce que la clé de répartition des revenus est respectés</b> (Is the revenue distribution among stakeholder respected) <b>1= Oui</b> (yes) <b>2 =Non</b> (No) <b>j). Si non pourquoi</b> (If No, why not ?)
<b>9. Est-ce que les fonds destinés à l'aménagement sont-ils utilisés pour autres choses que la restauration de la forêt</b> (Is the forest management fond used for actions other than Forest restoration) <b>1= Oui</b> (yes) <b>2 =Non</b> (No) <b>Si Oui quelles actions</b> (If yes, which kind of action)?
<b>10. Selon vous quels est la grande contribution de la gestion des forêts communautaires et des marchés ruraux dans cette zone</b> (according to you, what is the greatest contribution of the community based forest management and rural wood markets in this areas)?

<p><b>11. Selon vous quels est le grand problèmes que fait face la gestion des forêts communautaires et des marchés ruraux dans cette zone</b> (<i>according to you, what is the greatest problems facing community based forest management and rural wood markets in this areas?</i>)</p>
<p><b>12. comment pensez-vous que ces problèmes peuvent-il être résolus</b> (<i>how did you think these problems can be solved?</i>)</p>
<p><b>13. Avez-vous quelques suggestions ou commentaire sur la gestion des forêts communautaire ou sur les marchés ruraux de bois</b> (<i>Do you have any suggestion or comment on the management of community forest or rural wood market?</i>)</p>

### Appendices 3: Questionnaires for Torodi Municipalities

#### Fiche de collecte de données n° 3 (*Data collection sheet N° 3*):

**Note:** the questionnaire is bilingual: French in bold and English in italics

(Pour l’Autorité communal de Torodi (*for Torodi Communal authorities*))

<p><b>1. Comment appréciez- vous la gestion des forets communautaires et des marché ruraux de bois dans votre entité administrative</b> (<i>How do you appreciate the management of community forest and the exploitation of rural wood market in your administrative entity</i>)</p>
<p><b>2. Ya-t-il des conflits dans l’usage et la gestion des ressources forestière de la commune</b> (<i>Are there any conflict in the use of the communal forest resources</i>) ?  <b>1= Oui</b> (<i>yes</i>)      <b>2= Non</b> (<i>No</i>)  <b>Si Oui lesquelles</b> (<i>If yes, type of conflicts</i>)</p> <p><b>Comment affect-il la gestion de la forêt communautaire</b> (<i>How does it affect the management of the community forest</i>) ?</p>
<p><b>3. En cas de problèmes de gestion communautaire comment gérez-vous ces problèmes</b> (<i>in case of conflict in community forest management, how did you settle these conflicts</i>)?</p>
<p><b>4. Dans la gestion des forets communautaires quelle est le pourcentage de la commune</b> (<i>In the distribution of communal forest resources what is the percentage attributed to the commune</i> ?)  <b>Quelle est l’usage fait de ces fonds a votre niveau?</b> (<i>What the funds used for at the municipality level?</i>)</p>
<p><b>5. Appart cette part, quelle autre revenu tirez-vous de l’exploitation forestiers</b> (<i>Apart from this share which other revenue do you gain from forest exploitation?</i>)</p>
<p><b>6. L’exploitation des ressources forestières à travers les marchés ruraux améliore t’il les conditions de vie de la population</b> (<i>Did forest exploitation through rural wood market improve the living condition of your population</i>)?  <b>1 = Oui</b> (<i>yes</i>)      <b>2 = Non</b> (<i>No</i>)  <b>Si Oui Comment</b> (<i>if yes how</i>) ?  <b>Si Non pourquoi</b> (<i>if No why</i>) ?</p>
<p><b>7. Selon vous quels problèmes fait face la gestion des forêts communautaires et les marchés ruraux dans votre zone</b> (<i>according to you, which problems does community based forest management and rural wood markets face in your areas</i>)?</p>
<p><b>8. comment pensez-vous que ces problèmes peuvent-il être résolus</b> (<i>how did you think these problems can be solved</i>)</p>
<p><b>9. Avez-vous quelques suggestions ou commentaire sur la gestion des forêts communautaire ou sur les marchés ruraux de bois</b> (<i>Do you have any suggestion or comment on the management of community forest or rural wood market?</i>)</p>

Merci de nous donner votre temps (*thanks you for given us your time*)

