

Appraisal of the Participatory Forest Management Program in Southern Burkina Faso

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Cover: Top line: indication of a forest management unit; view on a newly cut plot; woman cutting a *Detarium microcarpum*
Bottom line: women on their way back from forest with shea nut; cattle grazing in a forest; fuelwood truck
(photo & design: P. Coulibaly-Lingani)

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Abstract

In many developing countries there has been a paradigm shift in forest conservation and management strategies, away from State-centred control towards community-based schemes, with twin goals of fostering sustainable forest management and reducing poverty. In Burkina Faso, various policy reforms have been introduced and attempts have been made to devolve use and management rights to local communities since the 1980s. However, it remains questionable whether communities' participation has yielded the intended improvements in livelihood and good governance. With the aims of providing a platform for developing strategies that promote sustainable forest management, the studies this thesis is based upon examined the participatory forest management program (PFM) in southern Burkina Faso in terms of people's access to forest products, members' participation, their perceptions of the program, and challenges associated with early stages of political decentralization. Quantitative and qualitative data were gathered through household surveys, focus group discussions and literature reviews. The results show that factors related to decision-making, forest conservation and economic benefits are the most important determinants of participation. Further, the determinants of access to forest resources differed among households, thus local management institutions need to take these variations into account to ensure that the livelihood needs of the poor are met. Despite the decentralization policy in force in the country since 1992, the State Forest Service is still heavily involved in the decision-making process. This considerably limits the active participation of local people. The results also show that, to some extent, participation in forest management activities is influenced by gender, household size, land tenure status, marital status, and forest legislation and implementation of forest laws and regulations. The performance of the PFM groups was found to vary, depending on their proximity to roads and market. Members' perceptions of the PFM seem to focus on their ability to generate income to support their livelihood, while less emphasis is placed on forest conservation. To enhance the outcome of the forest management program, the following strategies could be considered: securing user rights and empowering forest users by promoting the direct involvement of vulnerable and marginalized groups (women and migrants), increasing participation incentives, and enforcing the decentralization measures after addressing the challenges to enhance good governance and ensure equitable benefit-sharing.

Keywords: Burkina Faso, forest dependency, common-pool resource, property rights, gender, collective action, participation, accountability, decentralization.

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Dedication

To my late father Pascal

To my mother Marie-Madeleine

To my husband Fatié

To my son Yann Cédric and my daughter Yaana Carolle

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List of Publications

This thesis is based on the work contained in the following papers, referred to by Roman numerals in the text:

- I Pascaline Coulibaly-Lingani, Mulualet Tigabu, Patrice Savadogo, Per-Christer Oden, Jean-Marie Ouadba (2009). Determinants of access to forest products in southern Burkina Faso. *Forest Policy and Economics 11*, 516-524.
- II Pascaline Coulibaly-Lingani, Patrice Savadogo, Mulualet Tigabu, Per-Christer Oden (2011). Factors influencing people's participation in the forest management program in Burkina Faso, West Africa. *Accepted in Forest Policy and Economics*
- III Pascaline Coulibaly-Lingani, Mulualet Tigabu, Patrice Savadogo, Per-Christer Oden (2010). Performance of four participatory forest management groups in Burkina Faso, West Africa. *Submitted to Environment, Development and Sustainability*.
- IV Pascaline Coulibaly-Lingani, Patrice Savadogo, Mulualet Tigabu, Per-Christer Oden, Jean-Marie Ouadba (2011). Decentralization of forest management in Burkina Faso: issues and challenges. (Manuscript).

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The contribution of Pascaline Coulibaly-Lingani to the papers included in this thesis amounted to ca. 80% of the total work load.

Abbreviations

FAO	Food and Agriculture Organisation of the United Nations
MED	Ministère de l'Economie et du Développement
UNDP	United Nations Development Program
FMU	Forest Management Unit
IPCC	Intergovernmental Panel on Climate Change

1 Introduction

1.1 Background

The world's total forest area amounts to just over 4 billion hectares, equivalent to 31% of the total land area, and on average of 0.6 ha per capita (FAO, 2010). Eighty percent of these forests are publicly owned (FAO, 2010) and thus primarily under central State government control. Forests have often been exploited improperly for various purposes and the rate of deforestation is alarmingly high, despite recent signs of slowing globally, especially in the tropics due to forest clearance by people and land conversion for uses such as agriculture and infrastructural development (FAO, 2010). The destruction of natural forests has profound effects on many poor rural families who are dependent on forest resources that are capable of supplementing their income, providing safety nets and thus enhancing their welfare (Angelsen & Wunder, 2003). The depletion of forest resources has also accelerated soil degradation, increased flooding, and overtaxed the land's capacity to regenerate and sustain ecosystems (IPCC, 2001).

Deforestation is often attributed, to a large degree, to weak governance structures (Gregersen et al., 2004) and the inadequacy of the traditional State owned and run systems of forest management for sustaining the forest resource base against growing human and livestock population pressures and overall economic development of forest-fringe populations (Matta & Alavalapati, 2006). Forest management concerns not only the physical management of the forests. It also involves enforcement of forest laws and regulations, accompanied by forest research and education to identify

appropriate measures to sustain the forest's biophysical structure (Bellefontaine et al., 2000). There is increasing awareness of the importance of institutional-organizational frameworks, comprising sets of rules, norms and actors related to the management of forest resources (Agrawal & Gibson, 1999; Margerum, 1999; Kant & Berry, 2001; Adhikari et al., 2004). Hence, in recent decades there has been a major shift towards more decentralized and people-oriented forestry management regimes (Pulhin *et al.*, 2007; Klein *et al.*, 2007; Turyahabwe, & Banana, 2008) and significant progress has been made towards developing concordant forest policies, laws and national forest programs. Close to 75 % of the world's forests are currently covered by a national forest program, i.e. a participatory process for the development and implementation of forest-related policies and international commitments at the national level (FAO, 2010). It is now being recognized that local communities need to be involved in establishing forest management systems. Governments are opening a number of opportunities for sustainable forest management and biodiversity conservation by decentralizing authority and responsibility for resource management in various parts of the world.

1.2 Community forestry regimes

In many countries, different terms are used to indicate the involvement of local communities in forest management. They include, *inter alia*: community forestry (CF), collaborative forest management (CFM), participatory forest management (PFM), decentralized forest management (DFM), community-based forest management (CBFM) and joint forest management (JFM) (Sarin, 1995; Grazia & Grazia, 1996; Leach *et al.*, 1999; Colfer, 2005; Blomley & Ramadhani, 2006; Ribot *et al.*, 2006; Tacconi, 2007; Mutimukuru-Maravanyika, 2010) each of which tends to have a specific meaning and to be associated with particular projects or programs. Attempts to realize effective and meaningful involvement of local communities were first made in the Asia-Pacific region, in the form of various community-based forest management initiatives and the devolution of management responsibilities for some forestry activities to local government units in the Philippines, land and forest allocation programs in China, Laos and Vietnam, transfer of use rights to forest user groups in Nepal, Joint Forest Management programs in India, and privatization of forest plantations in New Zealand (Paul & Chakrabarti, 2011).

Although all the terms used refer to the involvement of local communities in forest management, the level of involvement can vary substantially from one form to the other. However, all involve interventions, based to varying extents on local people's knowledge and wishes, but 'legitimized and strengthened by government recognition' (Ingles *et al.*, 1999). The concept of community forestry emerged from recognition of the need for forms of forestry that are responsive to local needs, as opposed to State forestry, which is based on the notion that State agencies have unique capacity to manage the resources. Berkes (1997) stressed the importance of "trying to develop equitable partnerships, drawing upon the complementary strengths of forest departments and local users" in the co-management of forest resources. Initially, involvement of local people in forest management was referred to as social forestry (Fisher, 1995), in which local people were involved in small-scale activities as a means to improve their livelihoods (FAO, 1978; Fisher, 1995; Wiersum, 2004). The FAO (1978) defined community forestry broadly as any situation that intimately involves local people in forestry activity. Community forestry is also referred to as a common property management regime that is intended to achieve sustainability by linking local people's social and economic interests with forest conservation (Taylor, 2000; Sikor, 2006).

Community-based forestry has become a key element of government policies and programs aiming to foster sustainable forest management and reduce poverty during the past three decades in many developing countries (Polansky, 2003). In community-based forestry processes, local people are involved in diverse ways that are broadly encompassed by the term participatory forest management (Wily, 2003). According to the cited author, "community" in the context of participatory forest management refers to people living within or adjacent to the forest. Community-based forestry is believed to benefit all people living within and close to the forests by improving resource management and rural community livelihoods. However, it is more admired as a principle than it is understood and implemented in practice. Within the rural community some members may obtain benefits from forest exploitation while others (often the poor) are marginalized (Edmunds & Wollenberg, 2003). Further, there is ample evidence of community-based forest management resulting in "elite capture", which refers to situations where more privileged members of communities dominate decision-making processes at the expense of other groups (Ribot, 2004; Saito-Jensen *et al.*, 2010). Therefore, many scholars have questioned whether communities' participation has yielded the

intended improvements in livelihood for the poor, democratic decision-making and equity (Ribot, 2002a; Shackleton *et al.*, 2002).

Nevertheless, the social forestry programs implemented during the 1970s and 1980s in South and South East Asian countries did provide opportunities for forest department personnel in these countries to enter into dialogue with the local communities. Thus, they laid the foundations for new forest policies recognizing the importance of decentralization and the empowerment of local communities as fundamental instruments for the management and conservation of forest resources (Balooni & Inoue, 2007). Further notable changes in forest management occurred during the early 1990s with the emergence of so-called Decentralized Forest Management (DFM). This is an alternative to centralized or State-regulated forest management, which transfers forest use and management rights to local communities. DFM has no single definition, broadly referring instead to the State's willingness to move away from the command and control approach to forest management.

In India, the DFM movement gained momentum and was formally institutionalized as a Joint Forest Management once people's participation in forest protection and management had been incorporated into the new National Forest Policy of 1988 (Balooni & Inoue, 2007). Joint Forest Management (JFM) refers to the development of partnerships between fringe forest user groups and the Forest Department (FD) in the region based on mutual trust and jointly defined roles and responsibilities with regard to forest protection and development. Joint Forest Management (JFM) is considered to be a successful regime, currently in force in all the States of India, as it incorporates forest user groups in the decision-making process of forest management. Joint Forest Management Programs seek to develop partnerships between local community institutions and State forest departments to foster sustainable management and joint benefit sharing of public forest lands. The primary objective of JFM is to ensure sustainable use of forests to meet local needs equitably while ensuring environmental sustainability (Jayakumar *et al.*, 2007). In JFM, the users (local communities) and the owner (Government) manage the resources and share costs equally, but it is difficult to generalize the JFM approach in the light of variations across the nation with respect to geography, resource base, socio-economic status, cultural diversity and pressures on forests. However, under the JFM program, residents of forest-fringe villages have been provided access to forest produce to meet their basic fodder, fuelwood and non-timber forest

product (NTFP) needs. In lieu of this, people are protecting and managing the forests in cooperation with the FD.

Another form of change from State to community property is Collaborative Forest Management (CFM), a generic descriptor of a range of participatory approaches involving some form of co-management between government forest agencies and other stakeholders (Petheram et al., 2004). It is defined as a working partnership scheme between the key stakeholders (local beneficiaries, local government and central government) in the management of a given forest. This definition encompasses a variety of partnerships, in various tenure situations, and recognition of the need to manage complex social and institutional, as well as silvicultural, issues (Carter & Gronow, 2005). Collaborative approaches have arisen in both production and protected forests (Misra & Kant, 2004). In the conservation arena, Fisher (1995) and Hartanto et al. (2003) have proposed that collaborative management should be used as a generic term to describe resource management approaches that combine three elements: recognition of the legitimacy of the values of development and conservation, acceptance that development and conservation goals are not necessarily antagonistic, and commitment to engage local people in environmental management.

In Nepal another model of devolution of power, named Community Forestry, emerged as a result of institutional failure that had led to the degradation of forests in the central hills (Kanel & Dahal, 2008). It is one of the most highly prioritized policies in the country, widely applied throughout the country. Advanced legislation and attitudinal changes in the field staff have made the program very dynamic. This is very popular and has gained high momentum. This 'model' is particularly associated with hill community forestry in Nepal, where experience over the last 25 years has been well documented (e.g. Gilmour & Fisher, 1991; Hobley & Malla, 1996; Shrestha & Britt, 1998). Community forestry was seen as a rational response to the problem of managing tens of thousands of scattered forests in difficult terrain, many of which were degraded and of little national or commercial importance. Community forestry effectively reversed the earlier policy of nationalisation, which had led to widespread 'open access' and, in some areas, to the inequities of *de facto* private or feudal control. In this most notable example of devolution, community forestry is now entrenched in Nepal and the debate over its implementation has moved on to second-generation issues, such as pro-poor benefit sharing.

In the Sub-Saharan African context, the origin of community forestry discourse can be traced to participatory natural resource management movements (Western & Wright, 1994). These movements began in the late 1980s, encouraged by donor interests in conservation and more sustainable management of natural resources, and in community management as a means of achieving it. Advocates argued that bringing local people into the forest decision-making and management has a positive impact on the sustainability of this resource. They further argued that by using the sustainable use paradigm, participatory forest management strategies help to alleviate local poverty by enhancing the managerial capacity and skills of local people. The participatory forestry rhetoric was appealing to donors who co-opted it, making it one of the conditions for forest aid from rich developing countries. For governments lacking the resources to administer large and remote areas, community forestry had the added attraction that it could shift some of the costs of forest protection and management to communities, and has potential to reduce destructive actions of rural populations that have previously felt excluded from access to forest benefits (Arnold, 2001). The process varies from country to country, but usually involves contracts with community-level institutions that set out commitments (such as provision of labour for protection and planting) in return for rights and benefits (such as the right to harvest and sell forest produce, and exemptions from fees, royalties and licensing requirements). Experiences from different countries indicate that community-based forestry can encompass diverse sets of activities, providing different sets of rights and responsibilities to communities with varying understandings of who or what the communities consist of, and who represents them (Twyman, 2000; Matose & Watts, 2010). There is a need to ensure that each form of devolution of power to local communities leads to successful fulfilment of the commonly assigned twin goals of poverty alleviation and forest conservation. Therefore, there is a growing call to assess participatory forestry programs by addressing issues related to community members' access to forest resources and decision-making processes, and the ability of the community-based forestry system to ensure members' participation.

1.3 Rationale of the research underlying the thesis and problem analysis

Historically, in many francophone West African countries, including Burkina Faso, much of the forest resource used to be controlled by traditional authorities, as part of broader systems of control of land and use of land. These systems became overlaid in the colonial and postcolonial periods with varying degrees of State tenure and control over forest and tree resources, and often over tree-bearing land. In a series of land-tenure laws enacted in 1825, 1848 and 1899, the French West African colonies claimed forests as State property, and the first forestry code, issued in 1900, confirmed colonial State control of forests (Agrawal & Ribot, 1999). A more elaborate forestry code, passed on 4 July 1935 (République de Côte d'Ivoire, 1949), handed even more responsibility for the forests in the region to the French West African Forest Service. Under this decree, all or part of the land classified as forest was to be exempt from human use. Local communities were seen as a threat to the environment and the location of villages close to classified forests was discouraged (Foury, 1948). Due to the expansion of shifting cultivation in the 1930s, large parts of the North Sudanian zone of West Africa were delimited and protected by the colonial administration as wildlife sanctuaries, to prevent land use change (Sheperd, 1992). After independence (in 1960), forest codes of the new State adopted the principles of the 1935 Decree, and established forests as properties of the State (Bertrand, 1991).

Since the mid-1970s there has been a growing need to ensure that local people have access and rights to use the nearby forest, and that they are able to develop a sustainable relationship with them. During this period development strategies and practices moved towards a rural orientation (World Bank, 1978), accompanied by awareness of the need to help rural populations mobilise by devoting greater efforts to meeting their “basic needs”. Meanwhile, the woodfuel crisis (Eckholm, 1975) that followed the jump in fossil energy prices in 1973 and accelerated reductions of tree cover in Sahelian countries during and after the prolonged period of drought in the 1970s, drew more attention to the dependence of people on forests. These factors also raised awareness of the need to employ the knowledge of people living near the forests (through dialogue and collaboration) to maintain the vegetation cover.

In Burkina Faso, State forest reserves account for 25% of the total area of forests and woodlands, which cover 7.1 million ha (26%) of the country's land area (Kaboré, 2004). The participatory forest management programs in West African countries, including Burkina Faso, are believed to originate from concerns arising from the fuelwood crisis and the failure of centralized forestry policies inherited from the colonial period (Amanor, 2004). To meet the fuelwood needs of the urban population and control desertification, large-scale plantation projects were initiated using exotic species, such as *Eucalyptus camaldulensis* Denh., *Gmelina arborea* Roxb. and *Tectona grandis* L. f. These projects were costly and unsuccessful because they failed to engage local people through dialogue and collaboration (Bellefontaine *et al.*, 2000; Zida, 2007). Moreover, State policies and institutional strategies did not involve local people fully since they failed to offer them opportunities to enhance their livelihoods. Thus, to overcome these constraints it was necessary to develop new policies.

From the 1980s, interest in natural forest management has increased, and participatory forest management (with wide responsibility and ownership assigned to the local population) has been implemented (Kaboré, 2004). In 1986, a participatory forest management program was initiated by the Ministry of the Environment and Water with the support of a joint FAO and UNDP project (UNDP/FAO BKF), which strongly encourages involvement of local people (Delnooz, 1999; Ribot, 1999). The program has been implemented in areas within 150 km of Ouagadougou (the capital of Burkina Faso) with the aim of providing the city with fuelwood in a sustainable manner. Consequently, several forest management domains (FMDs) have been established throughout the country, *inter alia* the Sissili and Ziro provinces of southern Burkina Faso. In each FMD, several operational forest management units (FMUs) with areas ranging from 2 000 to 4 000 ha have been established. The FMUs are managed by several forest management groups (FMGs) composed of villagers residing adjacent to the forests. Management agreements have been made between the villagers and the Forestry Service, and a management plan has been prepared to regulate wood extraction, and activities that foster ecosystem conservation and biodiversity protection. Following the introduction of the participatory forest management policy, from 1991 a decentralization process started in the country and in 1997 a new Forestry Code was enacted. The decentralized forest governance in the participatory forest management programs is intended to ensure communities' rights of access to forests and engage them in sustainable forest management. The implementation of the

participatory forest management program in Burkina Faso has high importance since almost 90% of households in the country rely on fuelwood for their energy supply (Rouamba, 2003). Further, non-timber forest products (NWFP: fruits/kernel, gums, honey, etc.) are largely used for subsistence in the households and for national and international trade. For example, shea butter derived from *Vitellaria paradoxa* is reportedly the second most important export from Burkina Faso, after cotton (FAO, 2009).

In Burkina Faso, as in most African countries, involving local communities in the management of forests is well underway. As a whole, issues of forest management are as much matters of technical management of biophysical aspects of the forest as a governance issue. In Burkina Faso, regulatory frameworks have been established to provide policy and legal support for management of the forests through National Forestry Policies, National Forest Management Plans and (particularly) the new forestry legislation noted above. All of these legal guidelines stress the importance of increasing local participation in forest management. However, while PFM programs have engendered significant interest and general awareness in forest management among rural communities in the project areas (Kaboré, 2004), it remained unclear, prior to the studies this thesis based upon, whether local people have effective control of the resource (Hagberg, 1998; Delnooz, 1999). Nguiguiri (1999) emphasized the need for a better understanding of what works and does not work, and investigations of possible ways to improve and streamline the implementation of PFM. Hence, more research was needed to fully understand related issues, such as the following.

a) *Local peoples' access to forest products, equity in rights and benefits from the forest resource.* PFM should engage local communities as users and foster their cooperation by legalizing some of their forest access. However, residents of forest-fringe villages are not homogenous and households might have unequal access to forest products to meet their basic needs of fodder, fuelwood and NTFP. Thus, it is important to ascertain the attributes of individuals that influence their access to the forests in Sissili province for fuelwood collection, grazing livestock and extraction of NTFPs. What factors may constrain access to these products?

b) *Local people's participation.* This has been a key issue for the PFM program; understanding factors that influence households' participation in the forest management program may be crucial for forest managers and decision-makers. What makes people participate in the PFM program in

Burkina Faso? In particular, how does forest dependence (share of income from the forest) affect households' participation choices? Obtaining answers to these questions is vital for assessing local responses to devolution policies. They would provide indications of the appropriateness of devolution programs as pro-poor and forest-conserving strategies, and hence yield important insights for improving the programs.

c) *Local people's perception of the PFM.* These perceptions have strong bearings on its adoption and sustainability. Therefore, identifying the reasons why individuals choose whether or not to participate in voluntary organizations may contribute to improvements in the PFM processes. If community members are to participate in a sustainable forest management program, they first need to believe that the practices are important, that they provide a safe rural environment, and that they will bring in a stable and long-term income. Therefore, measuring members' perceptions and the performance of forest management groups, and understanding how factors such as the resource-base, group characteristics, knowledge of the environment and perceived benefits and losses influence their perceptions is essential for successful decentralization of forest management.

d) *The need for stronger and more legal institutional forms to entrench local roles.* This is universally felt to enable formal divestment and the exercise of meaningful jurisdiction. In PFM, accountability, transparency, empowerment and equity are becoming pivotal, both to those with whom management agreements are signed and internally to make local forest managers accountable to the wider communities on whose behalf they act. In the process, institutional issues increasingly concern PFM developments and pose the most challenges to the development of effective and democratic norms of local level governance over forests.

2 Objectives

The goals of the work this thesis is based upon were to examine the participatory forest management program in southern Burkina Faso in terms of people's access to forest resources, members' participation and their perception of the program, the challenges associated with early stages of administrative decentralization and forest management. Hence, the overall aim was to contribute to understanding of factors that foster the participation of local communities in co-management and provide a platform for the development of strategies that promote sustainable forest management. The specific objectives were to:

1. Identify and analyze the key determinants of access to the forest resource (**Study I**);
2. Identify and characterize factors that influence local people's decisions to participate in forest management programs and ways in which the State Forest Service influences local people's participation in the program (**Study II**);
3. Examine the variation in perceptions and performance of the participatory forest management groups among four FMUs and determine if this variation is attributable to the resource characteristics, group characteristics or proximity to the market (**Study III**);
4. Identify and analyze the issues and challenges to the implementation of the decentralization policy in forest management in Burkina Faso (**Study IV**).

3 Concepts and theoretical considerations

In this research, theories and perspectives related to common-pool resources, property rights and access, collective action, participation and participatory approaches, and power relationships provided a theoretical base for examining the participatory forest management program process. Thus, a brief account of each of these aspects is presented below.

3.1 Common-pool resources, property rights and collective action

3.1.1 Common-pool resources

Common-pool resources (CPRs) are defined as natural resources with size or characteristics that make it costly or difficult to exclude potential beneficiaries from obtaining benefits from their use, and one person's use of them subtracts from its use by others (Ostrom, 1990; Ostrom *et al.*, 1992; Dietz *et al.*, 2002). Examples of CPRs are forests, ocean fisheries and grasslands. Knowledge of associated property rights is crucial for understanding socio-economic aspects of CPRs. A theory that has been widely applied in considerations of the management of CPRs is "the tragedy of the commons" Hardin (1968), which holds that CPR users are unable to self-organize to preserve their resources. This is due to the presumption that users of common resources become trapped in an inevitable commons dilemma and are unable to find solutions to avoid destruction of the resources they use. Consequently, Hardin recommended privatization or government control as alternatives for sustaining common resources over the long term. He perceived these options as being the only ways through

which uses and users of the CPRs could be regulated (Feeny *et al.*, 1990). However, Berkes (2000), Dietz (2003) and Pretty (2003) subsequently disagreed, suggesting that factors such as strong local knowledge, practices and institutions can make communal management of common-pool resources sustainable over the long term.

3.1.2 Property rights

Property rights refer to the rights to use a resource (Alchian & Demsetz, 1973). Fundamentally, there are two types of rights governing uses of common pool resources: customary rights and legal rights. For every right an individual holds, there are rules that authorize or require particular actions to be taken in exercising that property right (Schlager & Ostrom, 1992). Access is often referred to as a property right, but definitions of the terms vary. Access has been described as the right to enter and use CPRs such as forests (Schlager & Ostrom, 1992), but Ribot and Peluso (2003) define it as the *ability* to derive benefits from things (resources) and regard “property rights” as *rights* to benefit from a resource.

Thus, for Ribot and Peluso, “access” refers to a bundle of powers while “property rights” represent a bundle of rights. Access as a bundle of powers underpins a wider range of social relationships that can constrain or allow an individual to benefit from a resource. For Sikor and Lund (2009), property is about claims that are considered legitimate. Physical access, in terms of accessibility/proximity of a resource, does not necessarily entail social access. An individual can have physical access to a resource without having social access to it. Thus, social access is a key determinant of the benefits different individuals obtain from resources (Mosse, 1997). For this reason forest wealth has not generally been equitably shared within rural communities; some groups, such as poor people (Neupane, 2003; Adhikari *et al.*, 2004) and migrants or women in some cases (Nabanoga, 2005), have had limited access to forest resources.

Feeny *et al.* (1990) have identified the following four categories of property right regimes: State property, private property, communal property and open access. Under State property right regimes ownership and management control of a resource are held by the State. In private property regimes the property rights are the prerogatives of individuals or corporations (Blomley, 1991). Under a communal (Feeny *et al.*, 1990) or

“common property rights” regime, access is restricted to a specific group of resource users who hold their rights and duties in common (Ostrom, 1986; Bromley, 1991). Open access refers to situations where there are no well-defined property rights related to resources, so access to them is unregulated and open to everyone (Feeny *et al.*, 1990). Under an open-access regime, there is no defined group of users or owners. Further, users act independently and do not communicate or coordinate their activities in any way (Ostrom, 1999). The four types of arrangements are recognized to sometimes overlap; resulting in conflict situations (Meinzen-Dick & Knox, 2001; Tachibana *et al.*, 2001). As argued by Agrawal (2003) variations in forms of property rights are important since they can strongly influence the outcome of resource management.

Common property resources share the following two important characteristics: excludability and subtractability. Excludability refers to the difficulty or impossibility of controlling access by potential users, due to the physical nature of the resources. It is assumed that it would be difficult or costly to exclude others from accessing the resource. Subtractability refers to the presumption that even if users cooperate to improve the productivity of the resources, exploitation by one user will adversely affect the ability of other users to exploit the resources due to the characteristic(s) of the resources (Feeny *et al.*, 1990). The main criticism addressed to Hardin’s theory is that he did not consider the possibility of excluding people other than members of a defined community, under a communal property regime. Thus, Hardin’s perspectives implicitly deny the possibility of regulations arising regarding the use and users in a resource management system. Therefore, he has been criticized for considering communal property regimes to be like open access situations (Feeny *et al.*, 1990).

Scholars interested in common property have acknowledged the core role of common property rights for successful governance of a common-pool resource (Ostrom, 1990; Agrawal, 2001; Laerhoven & Ostrom, 2007). Subsequent analysts have acknowledged the core role of common property rights in successful governance of a common-pool resource (Ostrom, 1990; Agrawal, 2001; Laerhoven & Ostrom, 2007). Further, there is now wide recognition of the importance of a well-defined group of users for successful forest management (Dayton-Johnson, 2000; Gibson *et al.*, 2000). Schlager and Ostrom (1992) suggest that the following legal rights must be held by the resource users under a community-based natural resource management regime: a) the right to use the resource (e.g. cut firewood), b) the right to

manage it (e.g. plant seedlings and maintain fire-breaks), c) the right to exclude (determine who else may use the resource) and d) the right to alienate (transfer user rights to others by inheritance, sale or gift). Such bundles of rights are associated with geographical and social positions that provide users rights to enter and use resource products (physical and social access). Authorized users have rights to enter, extract and manage the resources, while rights to enter, withdraw and manage the resource, and exclude those lacking user-rights, are granted to the proprietors. Owners possess full rights to enter, use and manage the resource, exclude non-members from using the resource and sell (control) the rights over the resource (Schlager & Ostrom, 1992).

The participatory forest management program in Burkina Faso is a common property regime. Under this program, most of the forests are recognized as being State property, but the rights to manage them have been devolved to local communities living next to the forests, organized into forest management groups (FMGs). In addition, there are forests (located mainly in the buffer-zones of e.g. Sissili and Nazinga forests in Southern Burkina) that are managed by private individuals, mainly for wildlife conservation. A communal property regime is applied to some forests, such as some parklands dominated by tree species (e.g. parklands of *Vitellaria paradoxa* in Sissili province). There are also some forests for which access is unrestricted, access to them being open to anyone residing in adjacent villages.

This thesis, and the underlying studies, focus on the State forests managed under the participatory management program with recognition of local population's use rights. Use rights, management rights and the rights to exclude non-members from the use of some forest resources are recognized and allocated to the forest management group (FMG) members. Alienation rights are also granted to the user groups. The FMGs are based in the villages within the forest management areas (Forest Management Units). However, as acknowledged by previous authors (Lavigne-Delville, 2000; McCarthy, 2005), in the developing countries customary rights are sometimes associated with members' recognized legal rights. The customary rights are received through inheritance, while legal rights are acquired through group membership. Customary rights are connected with complex relationships among local community members regarding use of resources, and may either constrain or facilitate access to the resources for some categories of members. Further, differences between members in accessing a resource may

be based on socio-economic aspects, such as ethnicity, residence status or gender (Engel & Palmer, 2006), wealth status or occupational activity. Users of a given renewable resource can cooperate in various ways to manage a resource efficiently, or fail to do so (Agrawal, 2003). The management of a forest within an organised group could lead to collective action, and its emergence is thought to promote successful resource management.

3.1.3 Collective-action in common-property resource settings

Scott & Marshall (1998), defined collective action as “action taken by a group (either directly or on its behalf through an organization) in pursuit of members’ perceived shared interests”. In collective action, members may act individually, but more often they act through a group or an organization, either independently or with the support or encouragement of external agents, e.g. governmental bodies, non-governmental organizations (NGOs) or representatives of development projects (Meinzen-Dick *et al.*, 2004). There is a growing understanding of the importance of social capital for the success of any collective-action (Ostrom, 1994; Schmid, 2000). Social capital is defined by Putman (1993) as “...features of social organization, such as trust, norms (or reciprocity) and networks (or civil engagement), that can improve the efficiency of society by facilitating co-ordinated actions”. Further, Narayan (1997) argues that social capital consists of “... the rules, norms, obligations, reciprocity and trust embedded in social relations, social structures and society’s institutional arrangements which enable members to achieve their individual and community objectives”. Thus, social capital is a concept that encompasses trust (Coleman, 1988), social norms and reciprocity (Putman, 1993), features of social structures and networks (Lin, 1999; Putman, 2000). Several scholars have drawn attention to the positive impact of communication in establishing trust and mutual agreement on cooperation (Walker & Ostrom, 2007; Cavalcanti *et al.*, 2010). Communication is thought to improve cooperation because additional information can be used in solving complex resource issues (Luskin *et al.*, 2002). Collective action by a well-defined group may be essential for developing rules regarding the management and use of a resource between people belonging to the group.

3.1.4 Factors influencing collective action outcomes in common-property settings

There is a growing understanding that local users can successfully manage common property resources (Ostrom, 1990; Agrawal, 2003; Bray *et al.*, 2005). A community forest management program's success is defined in terms of integrated outcomes of ecological sustainability, social equity and economic efficiency (Agrawal, 2001; Pagdee *et al.*, 2006). Several explanatory factors have been identified as influencing the success and /or failure of community-based management schemes (Baland & Platteau, 1996; Agrawal, 2001; Dietz *et al.*, 2003; Pagdee *et al.*, 2006; Cavalcanti *et al.*, 2010). These explanatory factors (the relevance and importance of which vary between different places and times), can be attributed to characteristics of the resources systems, groups, institutional arrangements and external environment.

There have been several investigations of the relationships between biophysical factors or resource conditions and outcomes of the actions of organised groups (Ostrom, 1990; Wade, 1994; Baland & Platteau, 1999). These resource conditions are related to the size of the area concerned, boundaries of the resource, and proximity of human habitats to the resource. Group characteristics that have been postulated to influence collective action outcomes include, *inter alia*, their size, heterogeneity (in various respects), and levels of wealth. There is a growing understanding that smaller groups are more likely to engage in successful collective action than larger ones (Olson, 1965; Baland & Platteau, 1999; Poteete & Ostrom, 2004). However, Chamberlin (1974) demonstrated that the level of provision of collective good increases with group size, despite decreases in the size of individuals' contributions. Further, Olivier and Marwell (1988) argue that when a "good has pure jointness of supply and heterogeneity, group size has a positive effect on the likelihood that it will be provided". Gender has also been considered as an important factor for successful common-pool forest management (Jewitt, 2000; Agrawal, 2003; Agrawal, 2010). Size is related to group homogeneity, which has been identified as an important indicator of the initiation and continuation of self governance (Ostrom, 1990; Baland & Platteau, 1996). The major types of heterogeneity in a given group may be racial, ethnic, cultural or economic (Baland & Platteau, 1996). Homogeneity of individuals in a group has been postulated to facilitate the emergence of cooperative solutions, reductions in hierarchical and conflicting interactions and (thus) enhancement of resource management (Agrawal & Gibson,

1999). In contrast, Kant (2000) suggested that heterogeneity can create diverse and conflicting values and interests that may lead to low levels of cooperation and consequently increase environmental degradation.

Social heterogeneity is postulated to hinder cooperation, since it increases transaction costs (Adhikari & Lovet, 2006), reduces levels of trust between individuals and hence reduces contributions to the collective good (Alesina & Ferrara, 2000; Alesina & Ferrara, 2002). For Agrawal and Gibson (1999), a community must have shared characteristics, because shared norms can promote conservation (through prohibitive actions) and cooperative decision-making within the group. Community-level norms can facilitate resource management through the prevention of certain types of behaviour and encouragement of others (Coleman, 1990). Wealth disparity among community members reportedly has a negative effect on levels of collective action (Varughese & Ostrom, 2001) and protection of commons, but its effects are apparently weak, provided the interests of wealthy and poor people are aligned (Vedeld, 2000).

Agrawal (2003) suggested that gender-related differences within groups also influence the success of common-pool regimes, and that the gender composition of local forest management groups can affect prospects for forest conservation and regeneration (Agrawal, 2009). Her arguments stem from a feminist environmentalism perspective (Shiva, 1989; Shiva, 1994), according to which men and women have different relationships with their environment. Women in poor rural households are victims of environmental degradation in quite gender-specific ways, but are also active agents in environmental protection and regeneration (Agrawal, 1992). However, intra-gender power struggles, together with socio-cultural factors (such as gender divisions of labour) and economic factors can influence women's ability to participate in environmental development (Agrawal, 1997; Jewitt, 2000).

The nature of the relationships between groups and external authorities, infrastructure and socio-economic phenomena (e.g. roads, markets, technology, population pressure and State policies) may also affect users' ability to manage a resource successfully (Agrawal, 2001; Agrawal, 2003). Roads have ambiguous implications for forest management. Good roads can promote economic development by increasing access to markets (thus increasing prices of produce), but they can also increase risks of deforestation (Chomitz & Gray, 1995). Ouagadougou is located 150 km from Léo, the

district capital of Sissili province. Transportation costs, which are strongly related to the distance goods have to be conveyed and the condition of the roads, are limiting factors for fuelwood retailers (Arnold & Jongma, 1977). Hence, villages within easy reach of markets in urban centres receive more profits for their fuelwood when PFM is implemented (Lund, 2007). In contrast, the availability of technology may hypothetically lead to overharvesting of forest products, and thus is likely to affect the sustainability of forest management (Agrawal, 2003).

Literature on the relationships between demographic changes and resource management has a long history and noteworthy theoretical roots. Malthus (1798) assumed that the capacity of the population to grow is infinitely greater than the capacity of the earth to produce subsistence for mankind, since human populations can increase “geometrically” while the food supply can only increase “arithmetically”. Therefore, since food is essential for human life, unchecked population growth in a given area or the planet could lead to starvation. In addition, Malthus (1798), argued that there are “preventative checks” (such as birth control and marrying at a later age) and “positive checks” (such as famine, disease epidemics and war) on populations that slow their growth and prevent them from rapidly growing for too long. Subsequent empirical studies have more clearly established relationships between populations, demographic changes and community forestry resources, e.g. (Henry *et al.*, 2003; Paré *et al.*, 2008; Ouedraogo *et al.*, 2010). All three of these studies have stressed that the massive recent population growth in Sissili province in southern Burkina Faso could pose threats to the sustainability of forest resources in this area. This population growth was due to migration of farmers from the northern and central plateau parts of the country to the south, following severe droughts in the 1980s in Sahelian countries. Recent findings have also identified local governance relations as key factors affecting changes in forest conditions (Gibson *et al.*, 2000; Colfer & Capistrano, 2005; Colfer & *al.*, 2008). The international and national political interface is also believed to potentially challenge the promotion of community-based forest management settings (Ostrom *et al.*, 2002; Kaimowitz *et al.*, 2005; Blaikie, 2006). For instance, agri-business (large scale farming systems) has been found to contribute to changes in land use, accompanied by reductions in forest areas (Paré *et al.*, 2008; Ouedraogo *et al.*, 2010). Participation is regarded as a form of group/ collective decision-making that can also influence the outcome of common property regimes.

3.1.5 Politics of participation, power relations and State-community interfaces

Participation as a management approach and State-community interface

Public or citizen participation refers to people's participation at the local level, while stakeholder's participation generally refers to involvement of organized groups such as companies, NGOs, etc. (Patel *et al.*, 2007). The concepts applied in analysis of participation and participatory processes derive from two major backgrounds: political sciences and development theory. From the political sciences perspective, participation or participatory processes concerns issues related to democracy and citizenship (Smith & Ingram, 1993; Wagle, 2000), while development theory perspectives of participation are more oriented towards aspects of land use sustainability (Nelson & Wright, 1995; Chambers, 1997). Thus, participation can be regarded as: (i) an approach or ideology focusing on the analysis and/or promotion of community development, and (ii) a method, or set of guidelines and practices for involving communities or the general public in specific planning activities (Cleaver, 1999; Buchy & Hoverman, 2000).

Community participation is one approach to citizen participation. It involves ordinary citizens, especially local residents, in policy-making according to Wagle (2000), who also assumes that the involvement of ordinary citizens in policy-making and public affairs leads to policy decisions that promote public interests. The participation of communities in public actions can take place in diverse ways (e.g. citizen contacts, meetings and forest management activities). However, processes of democratisation, empowerment and involvement in decision-making are not evident in most cases of citizen participation (Cooke & Kothari, 2002). Citizen's participation or involvement varies in form and level. Arnstein (1969) describes citizen's participation in terms of a "ladder" of social power structures with eight rungs, rising from non-participation to participation with decision-making power. According to Agrawal (2001), participation is passive when a "participant is informed of decisions *ex post facto*; or attends meetings, assists in decision-making without speaking up", and active when a "participant expresses opinions whether or not solicited or taking initiatives of other sorts". She also refers to "nominal participation", "consultative participation", "activity-specific participation" and "interactive participation" (empowering), the last of which is seen as the highest degree of participation, since it applies when participants have a voice and influence group decisions. People's participation can depend upon many socio-

economic factors, as a community might not be a homogeneous social structure and gender-, age- or wealth-based discrimination may occur. Maskey *et al.* (2006) argue that the level of participation of users in forest management activities is determined by the benefits obtained from the common forest resources, and Marinoff (1997) suggests that decentralization of power to communities may promote effective participatory policy-making through raising people's political consciousness. Participation is generally perceived as a means to enable and enhance democracy (Appelstrand, 2002), generate empowerment, and enable decision-making (Stave, 2002).

Decentralization has come to be regarded as an essential element of environmental and development strategies in developing countries in the last two decades. It refers to a process through which powers, responsibilities and resources are devolved by the central State to territorial entities at a lower level and local government/locally elected re-representatives (Andersson, 2003; Ribot, 2004 ; Larson, 2005). However, outcomes of decentralization are thought to strongly depend on the type of powers transferred to lower levels and the accountability of local governments to their constituents (Ribot, 2002b; Larson, 2003). The possibility of attaining decision-making power is believed to be one of the major reasons why people may decide to get involved in forest management issues (Buchy & Hoverman, 2000). However, in any decision-making process, power could be expressed through various ways and forms.

Power relations

Power is a concept that is used to describe relationships between actors and their relative strength in negotiations with each other (Yeung, 2005). In the research this thesis is based upon, the perspectives of power presented by Dahl (1957) and Foucault (1980; 1981) were applied. Dahl (1957) defined power as relations of control/influence among people or actors. To specify the actors in a power relation, Dahl suggested that "actor A has power over actor B to the extent that he/she can get B to do something that B would not otherwise do". The term actors in this context encompasses both people and other animate or inanimate objects. Dahl (1957) suggested the following considerations to specify the actors in a power relation: a) the source or base of the power of the most powerful actor; b) the means or instrument used by him/her to exert power over the other(s); c) the amount or extent of

his/her power over the other(s); and d) the range or scope of his/her power over the other(s). The base of an actor's power consists of all the resources — opportunities, acts and objects that he/she can exploit in order to affect the behaviour of another actor (Dahl, 1957).

According to Foucault (1981), power is not something that is acquired, seized or shared, something one holds on to or allows to slip away". In other words, power is a strategy; it is exercised rather than possessed and is constituted in social relationships, such as networks, alliances and conflicts. Power is employed at all levels and through various dimensions, and Foucault suggests that the key question is how power is applied. For him, power leads to knowledge, which in turn feeds power. "...It is not possible for power to be exercised without knowledge, it is impossible for knowledge not to engender power" (Foucault, 1980). Applying this rationale to forest management, an actor's access to forest resources or his/her participation in the program may be influenced, for instance, by his/her identity, position in relation to institutions both outside and inside the household, and gender. For instance, in the context of southern Burkina Faso, owning larger pieces of land, possessing important income sources, having broader networks, holding leadership positions in the village, being able to access information and securing political support may all be sources of power for participants in forest management. However, power relations can also change over time. Power analysis can be extended to quantitative studies, in which it could be perceived as coercion. Following Dahl's concept of power, cause and effect relationships that can be measured empirically express a situation of power relationship. Such a conception of power is embedded in behaviourism, a central principle of which is to "treat social explanation as no different in principle from the explanation of non-social phenomena" (Clegg, 1989). As argued by Sayer (1992) "what produces an event has nothing to do with the number of times it has been observed to occur and nothing to do with whether we happen to be able to predict it". These considerations show that discovering how a given power is constituted could be an important step in the research process, and that participatory forest management programs involve social interactions that must be understood to examine how power is expressed and exercised in them.

4 Research methods

4.1 Study area and the settings

The work underlying this thesis was carried out in the forest management areas of the Centre-West Region, one of Burkina Faso's 13 administrative regions. The main reason for selecting this region was its importance for supplying fuelwood to the main cities; notably it supplies more than 75% of the wood used as fuel in Ouagadougou (Ouedraogo, 2002). The region has four provinces – Boulkiemdé, Sanguié, Sissili and Ziro – and the capital is Koudougou. The focus of the research was mainly on the forest management sites located in Sissili and Ziro provinces. Both provinces are located in southern Burkina Faso and lie between 11°02'–12°00' N and 01°30'– 2°80'W (Figure 1). The areas are characterized by low relief with an average altitude of 300 m above sea level, and consist of cultivated lands, settlements, open savanna, and clusters of woodlands and dry forests. The natural vegetation in both provinces includes Sissili State classified forest, Kaboré Tambi national park, the forest buffer zone bordering the Sissili forest, forest management units (FMUs) and unprotected forests. Unprotected forests constitute bush lands in the vicinity of villages and trees on fallows. The dominating trees species in the study area are: *Vitellaria paradoxa* Gaertn. F., *Parkia biglobosa* (Jacq.) R. Br ex G. Don., *Tamarindus indica* L., *Azelia Africana* Smith ex Pers, *Pterocarpus erinaceus* Poir and *Kaya Senegalensis* (Desv.) A. Juss (Paré *et al.*, 2008). Phyto-geographically, Sissili and Ziro provinces are located within the Sudanian or south-Sudanian ecological zone White (1983).

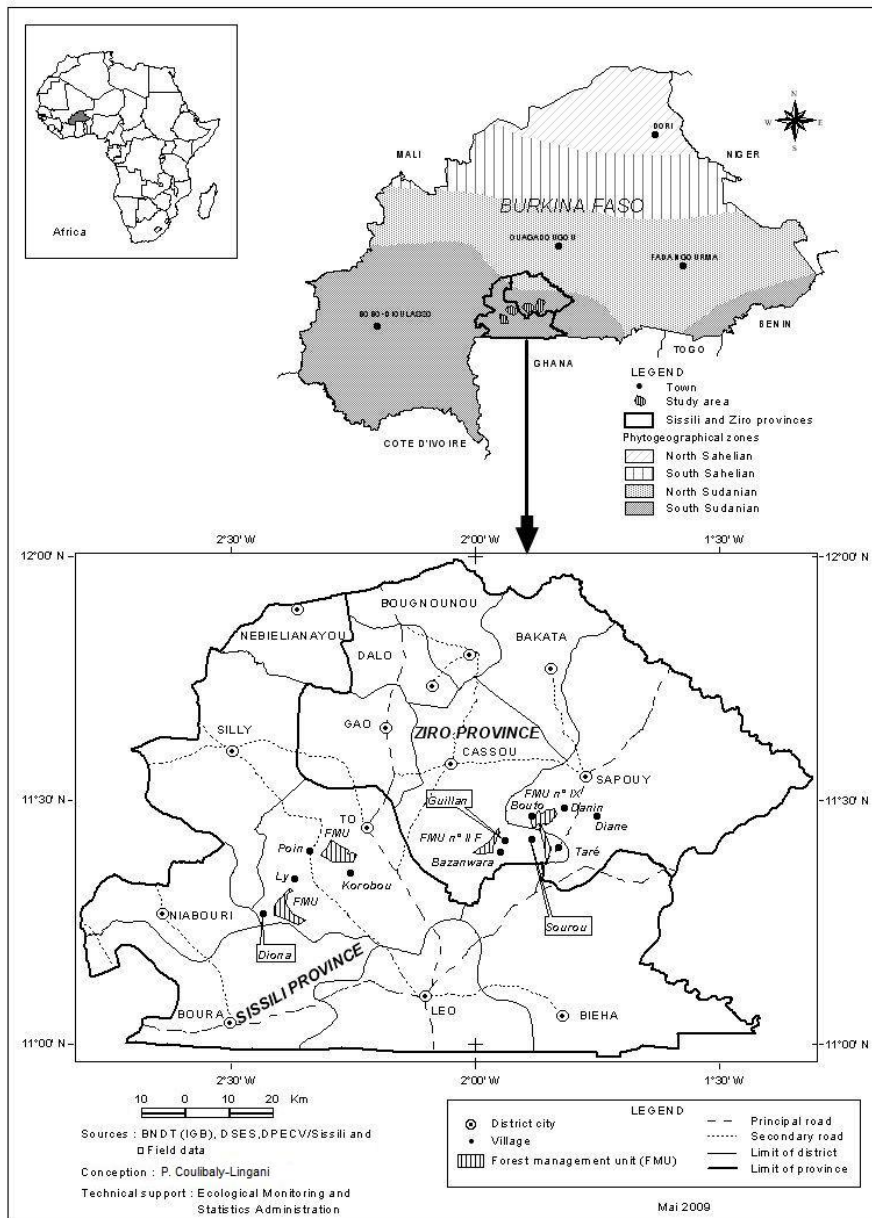


Figure 1. Map of the study area.

The population of Sissili and Ziro provinces in Burkina Faso consists of indigenous ethnic groups of Nuni and Wala, and migrant groups consisting mainly of Mossi and Fulani. The Mossi originated from the central plateau region of the country, while the Fulani people are herders from the northern region of Burkina Faso. Due to the harsh environmental conditions, exacerbated by persistent droughts (in 1973-74 and 1983-1984), the Mossi and Fulani people migrated from their respective areas to the southern region of the country in search of farmlands and pastures for their animals, respectively (Delnooz, 1999; Ouédraogo, 2003). The agricultural system is largely traditional subsistence farming dominated by cereals (e.g. sorghum, millet and maize) and tubers (yam and sweet potatoes), together with cultivation of cash crops (cotton and cashews). However, in the last decade, a more lucrative productive system, characterized by fuelwood extraction, cultivation of cash crops (cotton and cashews) and ranching, has emerged (Paré *et al.*, 2008).

Following a fuelwood crisis in the 1970s (Dang, 1993), Burkina Faso embarked on a tree planting program (mainly *Eucalyptus*) to meet the fuelwood demand. However, the plantation efforts have not been successful (Delnooz, 1999), mainly due to the lack of interest from the local populations. Consequently, a natural forest management program was initiated in the 1980s, focused geographically on the southern part of the country. Subsequently it was implemented with the assistance of a UNDP/FAO project between 1986 and 1998. The program was implemented in three phases, in which schemes or forest management domain were established in Nazinon, Ziro and Sissili provinces in 1986-1990, 1990-1994 and 1994-1998, respectively, where 1994-1998 is the period of the third phase. Examples of forest management schemes are Nazinon; Cassou, Bougnounou and Sapouy-Biéha in Ziro province, and Tô-Léo, Silly-Zawara –Pouni in Sissili province. The focus of this thesis and related studies is on Sapouy-Biéha in Ziro province and Tô-Léo in Sissili province. The forest management domains or schemes are subdivided into forest management units (FMUs). The program has particularly stressed the importance of local people's participation in managing the natural forests (Delnooz, 1999; Ribot, 1999). In this participatory forest management program, the villagers have organized themselves into forest management groups and entered into management agreements with the Forestry Service at the provincial level, mainly through management plans intended to foster ecosystem conservation and biodiversity protection, while enabling the local

people to benefit from the forests (Bellefontaine *et al.*, 2000). At the end of the program, management of all the forest domains was transferred to the Union of Forest Management Groups, and the Ministry in charge of forests through its regional and provincial offices, responsible for providing technical support (Delnooz, 1999; Yéyé, 2000). The forests allocated to the FMUs and the unprotected forests provide common interests for local people in terms of access to forest resources (e.g. fuelwood and NTFPs).

4.2 Data collection and analyses

4.2.1 Study I

This study dealt with determinants of access to forest products by the local people. In this context, access was perceived as “the ability to benefit from things – including material objects, persons, institutions, and symbols” (Ribot & Peluso, 2003), encompassing both entering into a defined physical property and obtaining products of a resource – access and withdrawal *sensu* Schlager and Ostrom (1992). To examine how key household characteristics and other constraints related to customary rights and formal forest laws influence access to the forests for fuelwood collection, extraction of NTFPs and grazing livestock by local people, a household survey was conducted in seven districts in Sissili province. The survey was conducted in 30% of the villages in each of the seven districts, resulting in 45 sample villages. A local census was then conducted in the selected villages to obtain an estimate of the population size. The households were stratified by gender and residence status, and 30% of the households in each sample village were randomly selected for the survey, yielding a total of 1865 sample households. The respondents were heads of the household, men or women, and each respondent was interviewed separately. A pre-tested semi-structured questionnaire was used for gathering information, and each interview lasted up to an hour. The checklist of issues discussed during the interview contained the following questions. Do you collect fuelwood and NTFPs from the forest management units and from the unprotected forest in the village? Do you graze your livestock in the forest management units and the unprotected forest in the village? Is there any constraint in accessing forest products? In addition, the following personal information was recorded for each respondent: household size, gender, age, residence status (indigenous versus migrant), education level, occupation and income-generating activities.

To assess the significance of socio-economic determinants of access to the forest for fuelwood collection, extraction of NTFPs and grazing livestock, three stepwise binary logistic regression models were developed, using the backward elimination procedure. The logistic model predicts the logit of the response variable (Y) from the explanatory variables (X). The logit is the natural logarithm (\ln) of odds of Y , where odds are ratios of probabilities (π) of Y happening to probabilities ($1 - \pi$) of Y not happening. The logistic model is specified as:

$$\ln (\pi / 1 - \pi) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}$$

where β_0 is the intercept and $\beta_1, \beta_2, \dots, \beta_k$ are the coefficients of the independent variables X_1, X_2, \dots, X_k . The explanatory variables were gender, age, household size, ethnic group, residence status, level of education, source of income and occupation. Dichotomous explanatory variables (gender and residence status) were coded by assigning 0 to one case and 1 to the other. For multinomial explanatory variables, coding was done by assigning 1.0 to the lowest number of cases and sequentially higher values for others. The response variables were access to the forest for collecting fuelwood, extraction of NTFPs, and grazing livestock, which were defined as binary variables with a value 1.0 for respondents having access to the forest product or 0.0 otherwise. Before performing the logistic regression, multivariate correlation analysis was applied to check for co-linearity between the explanatory variables. The tolerance values were all above the recommended threshold, thus there were no co-linearity problems. The significance of the logistic regression parameters was assessed by Chi-square likelihood ratio and deviation tests, and Hosmer-Lemeshow's and Wald's statistics. The significance of differences in effects of other customary regulations and formal forest law-related constraints to access forest products related to the investigated household characteristics were analyzed by χ^2 – tests.

Table 1. *Description and summary statistics of the variables used in the binary logistic model*

Characteristics	Number of observations	Fuelwood		NWFP		Grazing	
		Yes	No	Yes	No	Yes	No
<i>Gender</i>							
Female	904	461	469	723	207	512	418
Male	908	453	482	725	210	514	421
<i>Age class (years)</i>							
< 25	172	91	84	141	34	105	70
25 – 45	1048	563	499	845	217	627	435
45 – 65	496	212	296	381	127	244	264
> 65	96	38	58	64	32	40	56
<i>Household size</i>							
< 5	461	250	219	337	132	254	215
6 – 10	880	431	472	715	188	510	393
10 – 15	284	132	155	234	53	156	131
16 – 20	96	40	57	78	19	42	55
> 20	91	54	39	71	22	57	36
<i>Residence status</i>							
Indigenous	914	487	427	825	89	568	346
Migrant	935	427	524	623	328	458	493
<i>Ethnic groups</i>							
Nuni	774	410	396	729	77	491	315
Mossi	644	279	383	418	244	295	367
Sissala	78	74	4	75	3	76	2
Dagara	87	78	10	81	7	70	18
Fulani	190	58	134	108	84	80	112
Minority	39	15	24	37	2	14	25
<i>Educational level</i>							
Illiteracy	1340	692	679	287	1084	607	764
Primary School	198	102	99	24	177	89	112
Secondary school	31	12	20	7	25	18	14
Religious education	127	56	74	56	74	67	63
Adult education	101	43	58	43	58	45	56
Agricultural training	15	4	11	0	15	7	8

Table 1. (Continued)

Characteristics	Number of observations	Fuelwood		NWFP		Grazing	
		Yes	No	Yes	No	Yes	No
<i>Educational level</i>							
Illiteracy	1340	692	679	287	1084	607	764
Primary school	198	102	99	24	177	89	112
Secondary school	31	12	20	7	25	18	14
Religious education	127	56	74	56	74	67	63
Adult education	101	43	58	43	58	45	56
Agricultural training	15	4	11	0	15	7	8
<i>Occupation</i>							
Farmer	598	412	186	543	55	454	144
Herder	125	89	36	117	8	94	31
Farmer + Herder	1112	409	703	772	340	469	643
Farmer + Herder + Woodcutter	30	4	26	16	14	9	21
<i>Source of income</i>							
SNTFP + SCC + SL	842	365	512	684	193	379	498
SNTFP	123	95	34	95	34	108	21
SCC	201	170	32	173	29	170	32
SL	93	50	44	67	27	54	40
SNTFP + SCC	217	118	103	206	15	181	40
SNTFP + SL	198	59	142	131	70	73	128
SCC + SL	130	55	77	86	46	58	74
Salary	9	2	7	6	3	3	6

SNTFP: selling of non-timber forest products; SCC: selling of cash crops; SL: selling of livestock.

4.2.2 Study II

This study examined the extent to which the local people participate in the forest management program and whether household characteristics of members of the forest management groups (FMGs) influence their decision to participate in the program. Participation was regarded, *sensu* Little (1994) as “an active process whereby beneficiary or client groups influence the direction and execution of the development or management of a natural resource to enhance their well-being in terms of income, personal growth, self-reliance or other values.” Consequently, 15 participation indicators (Table 2) of the means whereby members of the FMG influence the direction and execution of forest management program were identified based on focus group discussions (with leaders of the forest management cooperatives, local chiefs, government officials, etc.) and participation indicators identified through literature reviews (Atmis et al., 2009; Dolisca et al., 2006; Lise, 2000). The main data source for this study was a survey of household representatives. More detailed information on factors influencing participation in the forest management program was obtained by conducting a household survey in 11 villages associated with the forest management program. From the list of members of the forest management group (FMG) in each village, 15 individuals were randomly selected for the survey, providing a total of 165 samples (both men and women) from 11 villages. They were asked the following questions. How often are you involved in forest management activities? How do you rank your involvement in forest management activities compared to other FMG members? How often are you involved in decision-making compared to other members? How often do you attend meetings of the FMG in comparison to other members? How do you rank the benefits you obtain from forest management activities with respect to the other members? The respondents’ demographic and socio-economic characteristics, including their education, gender, age, residence status and land tenure status, forest-based income-generating activities and household size were also recorded. Respondents were also asked if they had received any technical assistance from the State forest service or non-governmental organizations and their opinions about the influence of government policy on the extent of their participation in the forest management program (see Appendix 1).

Table 2. Names, abbreviations and scales of participation indicators included in the factor analysis

No	Names of the variables	Abbreviation	Scale
1	Benefit from fuelwood cutting	IFWC	[1-4]
2	Involvement in NTFP exploitation	INTE	[1-4]
3	Involvement in forest regeneration	IFRE	[1-4]
4	Involvement in firebreak maintenance	IFBK	[1-4]
5	Involvement in forest protection (reporting illegal activities)	IFPR	[1-4]
6	Involvement in forest monitoring and evaluation	IFME	[1-4]
7	Attendance of meetings	ATME	[1-4]
8	Suggestions during meetings	SUME	[1-4]
9	Ability to influence decisions during meetings	AIDM	[1-4]
10	Agreements on decisions during meetings	AGDM	[1-4]
11	Fairness and transparency in forest-based income allocation	FABS	[1-4]
12	Frequency of meetings	FRME	[1-4]
13	Generate household income	GHHI	[1-4]
14	Create employment opportunity	CEOP	[1-4]
15	Enabling micro-economic activities	EMAC	[1-4]

Descriptive analysis was then applied to summarize profiles of the respondents and information related to people's participation in the forest management program. Factor analysis was employed to identify latent dimensions underlying indicators of farmers' participation. Each factor was interpreted according to its loading, i.e. the strength of its correlations with the original variables (Tabachnick & Fidell, 1996). Principal Component Analysis (PCA) was used to extract factors, using Varimax rotation to ensure that the extracted factors were independent and unrelated to each other, and to maximize the loading on each variable and minimize the loading on other factors (Bryman & Cramer, 2005). The relevance of factor analysis for the data set was tested using the Bartlett Test of Sphericity and the Kaiser-Meyer-Olkin (Kaiser, 1974) measures of sampling adequacy. The number of significant factors was determined by calculating the eigenvalue for each factor (variance it accounted for) and confirmed by a Scree test and Monte Carlo PCA for parallel analysis (Watkins, 2000). Factors with eigenvalues exceeding 1.5 were considered significant following Kaiser's criterion. Multiple linear regression analysis was performed to assess the associations between participation indicators and respondents' socioeconomic and demographic characteristics. The following model was developed using Ordinary Least Squares (OLS) regression.

$$Factor_i = \text{Constant} + \beta_1 GDE + \beta_2 MAS + \beta_3 AGE + \beta_4 HHS + \beta_5 PFM + \beta_6 EDL + \beta_7 RES + \beta_8 LTS + \beta_9 TEA + \beta_{10} AGP + \epsilon$$

where $Factor_i$ are the factors identified from factor analysis, β_i is the coefficient of the socio-economic, demographic and policy-related variables, and ϵ is the error term. The subject score for each factor was determined following the Anderson-Rubin approach (Tabachnick & Fidell, 1996).

4.2.3 Study III

This study examined the variation in member's perception of the performance of four forest management units in Sissili and Ziro provinces and assessed the factors influencing members' perceptions of the performance. Both group discussions and a household survey were used to collect data on perceptions of the performance of the four forest management groups. The focus group discussions were held with leaders of the forest management groups, local government officers and NGOs to obtain qualitative information pertaining to the performance of the participatory forest management program. The indicators of participation (Table 2) identified in the previous studies were used as a basis for evaluating the performance of the FMUs. These indicators pertained to economic performance (benefits from fuelwood cutting, extraction of NTFPs, generation of household income, creation of employment opportunities and enablement of micro-economic activities), forest conservation (forest regeneration, maintenance of firebreaks, forest protection, and forest monitoring & evaluation), and decision-making (attendance of meetings, frequency of meetings, making suggestions during meetings, ability to influence decisions in meetings, agreements on decisions during meetings and equity in benefit allocation). Data on perceptions of performance of the FMUs were collected through a household survey of 216 members of four FMUs from 11 surrounding villages. Through random sampling, 20 respondents were selected in each village except one where the total number of group members was 16. The respondents, household heads (both men and women), were asked to score each performance indicator of the collective action on a 4-point Likert-scale: 1 = bad, 2 = satisfactory, 3 = good and 4 = very good. The respondents were also asked about their knowledge and awareness of any problems related to the forest environment, as well as their opinions about the influence of group size and ethnic dissociation on the performance of their village forest management program (see appendix 2).

The variation in performance scores of the four FMUs was analyzed by multivariate analysis of variance. Pearson correlation analysis was applied to examine the relationships between scores of each performance indicator and resource-base, group size and proximity to the main fuelwood market. Multinomial regression analysis was performed to evaluate whether the variation in performance of the FMUs was associated with members' knowledge of the forest environment, their perception of group size and heterogeneity. The dependent variables were scores for each performance indicator and the mean of each set of economic, conservation and decision-making indicators, which were regressed on the independent variables according to the following model:

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \text{error}$$

where Y_i is the value of the dependent variable, α is a constant and β_i are the coefficients of the explanatory variables, knowledge of the forest environment (X_1), perception of group size (X_2) and perception of group heterogeneity (X_3). During the model construction, variables with F values ≤ 0.050 and ≥ 0.100 were entered, and removed, respectively.

4.2.4 Study IV

This study reviewed progress made towards developing policies and programs to promote sustainable management of forests in Burkina Faso and identify the constraints and challenges for the implementation of decentralization in the context of forest management. Data were gathered through a review of relevant policy documents and literature, and the focus group method. The grey literature reviewed concerned the decentralization process and the policy reforms related to forestry in Burkina Faso. The focus group method was employed as tool to identify and assess the issues concerning, and challenges facing, decentralization of forest management in the Central-west region. The focus groups were identified on the basis of their involvement in the participatory forest management program and decentralization process. Subsequently, an invitation letter was sent to central, regional and local government bodies, the technical assistance group, the fuelwood sellers cooperative and community-based organizations in the Centre-west region of Burkina Faso, as well as representatives of NGOs. A two-day workshop was organized at the Sissili provincial capital (Léo). During the first day of the workshop the participants were introduced to the research problem; i.e., what are the issues and challenges for the implementation of decentralized forest management? Then four discussion

groups were organized, consisting of village councillors and chiefs, district governors (mayors or their representatives), technical support groups (experts from the central, regional and provincial agriculture, forest and animal husbandry services), and the forest management groups. Participants were asked to list and discuss issues related to the resource-base, accountability, transparency and empowerment, and the challenges posed by these issues to the decentralization of the existing forest management program in the region. Each group had a moderator in charge of facilitating the discussions and a secretary responsible for taking notes of the points raised by the group; both the moderators and secretaries were researchers from Centre National de Recherche Scientifique et Technologique, Institut de l'Environnement et de Recherche Agricole.

After sufficiently deliberating on the issues, each group presented a synthesis of their findings to all participants, which was followed by further discussion on the issues to stimulate the flow of details and impressions of the participants. By the end of the session, the outputs from each focus group discussion were used to generate a final set of opinions about the themes. On the second day, the participants were provided with a synthesis of the issues identified during the previous day and asked to rank them according to their degree of importance. The rankings by each focus group were then presented to all participants and further discussed to obtain insights into their agreements/disagreements. The discussions were held in French if all the members in the group were French-speaking, and otherwise translated into the local language, Nuni. The group discussions and the synthesis sessions were tape-recorded in order to facilitate compilation of data. The group discussion with representatives of the cooperative of fuelwood wholesalers and retailers was held separately, as this group has a stake in the forest management program but is not directly involved in the decentralization process. The discussion with this group mainly focused on issues relevant to the association, such as challenges related to fuelwood marketing and transparency in fuelwood transactions. The acquired information was used to cross-check the points related to transparency and accountability issues raised during the workshop.

The information gathered from the focus group discussion was subsequently transcribed using open coding – a process of breaking down, examining, comparing, conceptualizing and categorizing the information (Strauss & Corbin, 1990). Thus, major issues and challenges identified by participants were categorized into unifying concepts, and the participants re-

grouped into executives (district governors, village councillors and village chiefs), grass-root actors (the forest management groups) and technical support groups (experts from governmental and non-governmental organizations). The original rankings made by the focus groups were re-worked as per the new groupings by taking mean ranks.

5 Results

5.1 Determinants of access to forest products

The relationships between respondents' household characteristics and the likelihood that they would have access to fuelwood, NTFPs and forest for grazing livestock was investigated using logistic regression analysis. The likelihood of access to fuelwood was found to be significantly associated with ethnicity, occupation and sources of income of the household. The overall assessment of the logistic regression model and Hosmer–Lemeshow goodness-of-fit statistics revealed that it adequately fitted the data [$\chi^2_{(22, 1812)} = 247.568$, $p < 0.001$] with 70% correct prediction. The likelihood of respondents' having access to fuelwood was 8.3% and 3.1% higher for Sissala and Dagara, respectively, than for Nuni, Mossi, Fulani and minority ethnic groups (Table 3). Respondents engaged in either farming or animal husbandry had 1.9% and 3.5% more likelihood of access to fuelwood, respectively, than those engaged in both activities. In turn, those engaged in both farming and animal husbandry had better access than those involved in combined activities of farming, animal husbandry and wood cutting. Thus, the more diverse the source of income of the respondents, the lower was their likelihood of access to fuelwood (Table 3).

Table 3. Logistic regression predicting likelihood of reporting access to fuelwood. Note that the reference group in each explanatory variable is not included

Variables	β_i	s.e. β_i	Wald χ^2 -test	d.f.	Sig.	Odds Ratio (e β)	95.0% C.I. for Odds Ratio	
							Lower	Upper
<i>Age class</i>			11.254	3	0.010			
< 25	-0.021	0.151	0.020	1	0.887	0.979	0.728	1.316
25 – 45	0.281	0.095	8.736	1	0.003	1.324	1.099	1.594
45 – 65	-0.082	0.109	0.574	1	0.449	0.921	0.744	1.140
<i>Ethnic group</i>			55.933	5	0.000			
Nuni	-0.390	0.147	7.040	1	0.008	0.677	0.508	0.903
Mossi	-0.541	0.151	12.780	1	0.000	0.582	0.433	0.783
Sissala	2.112	0.454	21.660	1	0.000	8.261	3.395	20.101
Dagara	1.133	0.334	11.506	1	0.001	3.106	1.614	5.979
Fulani	-1.196	0.220	29.516	1	0.000	0.302	0.196	0.466
<i>Occupation</i>			97.598	3	0.000			
Farmer	0.659	0.175	14.177	1	0.000	1.933	1.372	2.725
Herder	1.244	0.218	32.632	1	0.000	3.468	2.264	5.314
Farmer + Herder	-0.305	0.162	3.528	1	0.060	0.737	0.536	1.013
<i>Source of income</i>								
SNTFP + SCC + SL	-0.184	0.178	1.076	1	0.300	0.832	0.587	1.178
SNTFP	1.238	0.254	23.701	1	0.000	3.448	2.095	5.674
SCC	1.177	0.241	23.748	1	0.000	3.244	2.021	5.207
SL	1.065	0.270	15.546	1	0.000	2.902	1.709	4.927
SNTFP + SCC	-0.283	0.209	1.830	1	0.176	0.754	0.500	1.135
SNTFP + SL	-0.266	0.220	1.469	1	0.226	0.766	0.498	1.178
SCC + SL	-0.370	0.237	2.431	1	0.119	0.691	0.434	1.100
Constant	0.129	0.246	0.276	1	0.600	1.138		

SNTFP: selling of non-timber forest products; SCC: selling of cash crop; SL: selling of livestock; Hosmer & Lemeshow Test: Chi-square = 12.85, d.f. = 8, p = 0.117; -2 Log likelihood = 2075.91; Cox & Snell r^2 = 0.21; Nagelkerke r^2 = 0.29; overall percentage of correct prediction = 70.3%.

With regard to the likelihood of access to forests for grazing livestock, the model fitted the data well [$\chi^2_{(22, 1812)} = 211.407$, $p < 0.001$] with 73% correct

prediction. Ethnic group, household size, age, gender, occupation and source of income were key household characteristics that significantly determined access to the forest for grazing livestock (Table 4). The Sissala ethnic group was more likely (15.3%) to have access to the forest for livestock grazing than other ethnic groups. However, the Mossi and Fulani groups had a lower likelihood of access to the forest for grazing than the minority groups (collectively the reference group in the model). Respondents with small (< 5 individuals) and very large (> 20 individuals) households were 1.1% less likely to have access to the forest for livestock grazing than medium-sized households. Adult heads of households (45-65 years old) also had more chance of forest access for grazing livestock. Men had 1.2% more chance to access the forest for grazing livestock than women. The more diversified the occupation and source of income of the respondent, the lower was the likelihood of access to the forest resource for grazing livestock.

The regression model for access to NTFPs was significant [$\chi^2_{(22, 1812)} = 336.229$, $p < 0.001$] and the Hosmer-Lemeshow goodness-of-fit test showed it provided an adequate fit to the data, with 82% correct prediction. Key determinants of access to NTFPs were gender, ethnic group, education level, household size, age, occupation and source of income (Table 5). The likelihood of access to NTFPs was 1.2% lower for households headed by women than for those headed by men. Among ethnic groups, Mossi and Fulani were less likely to have access, while Nuni, Sissala and Dagara were more likely to have access to NTFPs than the minority group. Compared with respondents who had received agricultural training, the likelihood of access to NTFPs was lower for all other respondents of all education levels, except illiterate individuals who had similar probability of access. The larger the household size of the respondent, the higher was the likelihood of access to NTFPs. Respondents within the most active age band (24-45 years) had a better chance of access to NTFPs compared with older respondents. The likelihood of access to NTFPs was lower for respondents engaged in more than one activity, and for respondents who generated their income through sale of NTFPs, sale of cash crops or sale of cash crops and livestock. Interestingly, the likelihood of access to NTFPs was high when respondents sold NTFPs and other agricultural products, such as cash crops and livestock, as shown by their relatively high odds ratios.

Table 4. Logistic regression predicting likelihood of reporting access to forest land for livestock grazing.
 Note that the reference group in each explanatory variable is not included

Variables	β_i	s.e. β_i	Wald χ^2 -test	d.f.	Sig.	Odds Ratio (e β)	95.0% C.I. for Odds Ratio	
							Lower	Upper
<i>Gender</i>	0.180	0.060	8.934	1	0.003	1.197	1.064	1.347
<i>Age class (years)</i>			13.637	3	0.003			
< 25	0.152	0.161	0.887	1	0.346	1.164	0.849	1.595
25 – 45	0.326	0.099	10.795	1	0.001	1.385	1.140	1.682
45 – 65	-0.045	0.113	0.161	1	0.689	0.956	0.766	1.193
<i>Household size</i>			11.476	4	0.015			
< 5	-0.255	0.122	4.376	1	0.036	0.775	0.611	0.984
5 – 10	0.018	0.100	0.032	1	0.858	1.018	0.837	1.238
11 – 15	0.073	0.131	0.307	1	0.580	1.075	0.831	1.391
> 20	-0.375	0.195	3.683	1	0.055	0.687	0.469	1.008
<i>Ethnic group</i>			39.321	5	0.000			
Nuni	-0.075	0.169	0.197	1	0.657	0.928	0.665	1.293
Mossi	-0.467	0.172	7.323	1	0.007	0.627	0.447	0.879
Sissala	2.731	0.619	19.431	1	0.000	15.345	4.557	51.674
Dagara	-0.122	0.296	0.171	1	0.679	0.885	0.495	1.581
Fulani	-0.576	0.230	6.264	1	0.012	0.562	0.358	0.883
<i>Occupation</i>			90.357	3	0.000			
Farmer	0.572	0.157	13.194	1	0.000	1.771	1.301	2.411
Herder	1.028	0.209	24.160	1	0.000	2.796	1.856	4.213
Farmer + Herder	-0.501	0.140	12.786	1	0.000	0.606	0.460	0.797
<i>Source of income</i>			130.866	7	0.000			
SNTFP + SCC + SL	-0.610	0.149	16.670	1	0.000	0.544	0.406	0.728
SNTFP	1.378	0.272	25.601	1	0.000	3.967	2.326	6.765
SCC	1.378	0.272	25.601	1	0.000	3.967	2.326	6.765
SL	0.843	0.226	13.935	1	0.000	2.324	1.493	3.620
SNTFP + SCC	0.429	0.247	3.029	1	0.082	1.536	0.947	2.490
SNTFP + SL	0.892	0.208	18.401	1	0.000	2.441	1.624	3.669
SNTFP + SL	-0.604	0.192	9.875	1	0.002	0.547	0.375	0.797
SCC + SL	-0.747	0.213	12.343	1	0.000	0.474	0.312	0.719
Constant	-0.598	0.230	6.727	1	0.009	1.818		

SNTFP: selling of non-timber forest products; SCC: selling of cash crop; SL: selling of livestock.
 Hosmer & Lemeshow Test: Chi-square = 9.22, d.f. = 8, p = 0.324; -2 Log likelihood = 1990.64; Cox
 & Snell r^2 = 0.24; Nagelkerke r^2 = 0.32; overall percentage of right prediction = 72.5%.

Table 5. Logistic regression predicting likelihood of reporting access to non-wood forest product. Note that the reference group in each explanatory variable is not included

Variables	β_i	s.e. β_i	Wald χ^2 -test	Df	Sig.	Odds Ratio ($e\beta$)	95.0% C.I. for Odds Ratio	
							Lower	Upper
<i>Gender</i> (F = 0, M = 1)	0.252	0.072	12.300	1	0.000	1.286	1.117	1.480
<i>Age class</i>			9.238	3	0.026			
< 25	0.140	0.194	0.523	1	0.470	1.151	0.786	1.683
25 – 45	0.309	0.115	7.244	1	0.007	1.362	1.088	1.705
45 – 65	0.012	0.128	0.009	1	0.924	1.012	0.788	1.301
<i>Household size</i>			18.495	4	0.001			
< 5	-0.573	0.143	16.066	1	0.000	0.564	0.426	0.746
5 – 10	-0.030	0.120	0.062	1	0.804	0.971	0.767	1.229
11 – 15	0.247	0.164	2.261	1	0.133	1.280	0.928	1.765
16 – 20	0.167	0.243	0.470	1	0.493	1.181	0.734	1.903
<i>Ethnic group</i>			139.003	5	0.000			
Nuni	0.326	0.217	21.143	1	0.133	1.385	0.906	2.118
Mossi	-1.423	0.207	0.068	1	0.00	0.241	0.161	0.362
Sissala	1.568	0.532	0.535	1	0.003	4.798	1.692	13.601
Dagara	0.303	0.416	16.407	1	0.466	1.354	0.599	3.060
Fulani	-1.453	0.260	4.291	1	0.000	0.234	0.140	0.390
<i>Education</i>			47.200	5	0.000			
Illiterate	0.397	0.267	2.213	1	0.137	1.487	0.882	2.508
Primary	-0.35	0.54	0.42	1	0.517	0.705	0.245	2.03
Secondary	-0.939	0.226	17.325	1	0.000	0.391	0.251	0.608
Religious	-1.409	0.263	28.592	1	0.000	0.244	0.146	0.41
Adult	-0.109	0.444	0.45	1	0.998	0.160	0	.
<i>Occupation</i>			56.535	3	0.000			
Farmer	0.562	0.196	8.205	1	0.004	1.754	1.194	2.576
Herder	1.040	0.333	9.764	1	0.002	2.829	1.473	5.431
Farmer + Herder	-0.660	0.163	16.325	1	0.000	0.517	0.375	0.712

Table 5. (Continued)

Variables	β_1	s.e. β_1	Wald χ^2 -test	Df	Sig.	Odds Ratio (e β)	95.0% C.I. for Odds Ratio	
							Lower	Upper
<i>Source of income</i>			45.949	7	0.000			
SNTFP + SCC + SL	0.477	0.162	8.677	1	0.003	1.611	1.173	2.212
SNTFP	-0.621	0.243	6.537	1	0.011	0.537	0.334	0.865
SCC	-0.096	0.244	0.154	1	0.695	0.909	0.563	1.467
SL	0.703	0.269	6.807	1	0.009	2.020	1.191	3.425
SNTFP + SCC	1.106	0.283	15.296	1	0.000	3.022	1.736	5.260
SNTFP + SL	0.284	0.205	1.926	1	0.165	1.328	0.890	1.984
SCC + SL	-0.526	0.224	5.505	1	0.019	0.591	0.381	0.917
Constant	4.744	1657.839	0.000	1	0.998	114.856		

SNTFP: selling of non-timber forest products; SCC: selling of cash crop; SL: selling of livestock. Hosmer & Lemeshow Test: Chi-square = 21.96, d.f. = 8, p = 0.501; -2 Log likelihood = 1488.68; Cox & Snell r^2 = 0.22; Nagelkerke r^2 = 0.33; overall percentage of right prediction = 81.8%.

The respondents stated that access to forest products was essential for their livelihoods. However, 6% of the rural respondents reported that they had difficulty in obtaining NTFPs and fuelwood. The major constraints to accessing forest products in Sissili province were the forest law and traditional rules of land and resource tenure. The responses reflected ambiguities regarding rights of control and ownership of the forest lands and the resources they offer. The forests are located on lands with multiple overlapping traditional and modern rights. Prevailing land law does not recognize customary land rights; all land is considered State property, and anyone seeking access to land must apply for use rights. On the other hand, local communities do not recognize this State ownership and regard themselves as the true owners of their land, by virtue of their ancestral rights. Further, while the State's monopoly of land ownership is theoretical, the traditional rules are still observed by the local communities under the leadership of indigenous ethnic group elders. The forest law, 'Code Forestier' adopted in 1997, specifies the access rights of users and the guiding principles for usufructuary rights and practices. This law precludes livestock grazing from managed forest, thereby limiting access to forest pastures by

livestock herders. Respondents mentioned that the lack of official recognition of traditional forest access rights has contributed to tenure instability. It has also encouraged a short-term mentality in the use of forest resources, for example through illegal harvesting of wood, NWFPs and charcoal processing, which compromises the sustainability of forest resources.

5.2 Factors influencing people's participation in forest management program

A typology of participation, involving 15 participatory indicators, was applied to examine the extent of participation of members of the forest management group in the participatory program. Factor analysis summarized the original 15 participatory indicators into three factors, which accounted for 64.82% of the total variance (Table 6). The most influential variables for the first factor, which explained 28.56% of the variation, are mostly indicators related to people's attitude towards the decision-making process (ability to influence decisions in meetings, agreement with decisions made during meetings, aptitude at making suggestions during meetings and meeting attendance) and were, thus, termed indicators of participation in decision-making. Agreement with decisions during meetings had the highest loading (0.923), followed by attendance at meetings (0.913), which may be considered the first step towards participation in the decision-making process.

Table 6. PCA loadings for indicators of participation in forest management

Description	Factor 1	Factor 2	Factor 3	Communality
Decision-making indicators				
Agreements on decision during meetings	0.923	0.083	0.181	0.891
Attendance to meetings	0.913	0.047	0.179	0.867
Ability to influence decisions in meetings	0.836	0.239	0.034	0.757
Suggestion during meetings	0.834	0.118	0.181	0.742
Fairness and transparency in income allocation	0.520	0.258	-0.046	0.339
Involvement in decision on forest monitoring & evaluation	0.500	0.344	-0.019	0.369
Frequency of meetings	-0.395	-0.460	0.316	0.467
Indicators of forest conservation				
Involvement in keeping firebreaks	0.070	0.930	0.102	0.880
Involvement in forest protection	0.230	0.883	0.073	0.838
Involvement in forest regeneration	0.206	0.756	0.356	0.741
Economic indicators				
Generate household income	0.218	0.164	0.826	0.757
Enabling micro-economic activities	0.315	-0.036	0.784	0.715
Create employment opportunity	0.450	0.170	0.711	0.736
Involvement in fuelwood cutting	0.183	0.183	0.633	0.494
Exploitation of NTFPs	-0.219	0.044	0.285	0.131
<i>Eigenvalue</i>	5.894	2.116	1.714	9.724
Variance explained (%)	28.562	18.748	17.514	64.824

Note: Rotation method: Varimax with Kaiser normalization. Rotation converged in five iterations (N=165) and factor loading with a value larger than 0.50 in absolute terms are bold-faced.

Most respondents had negative attitudes towards their participation in decision-making within the groups, with a high proportion (61%) feeling unable to influence decisions during FMG meetings. A further 51% expressed poor agreement with decisions made during FMG meetings and 59% expressed the opinion that they could not make suggestions during

meetings. Among members who felt that they could influence the decisions made during group meetings, 80% were involved in the executive committee. In addition, 73% of the members who felt that they could make suggestions during group meetings were executive members and 59% of the executive committee members said that they could express their opinions in group meetings. These findings show that the decision-making process within the FMGs is the prerogative of a few powerful individuals, who are generally the more educated people in the village (information obtained from group discussions including the FMG leaders and locally elected councillors). The frequency of meetings was negatively loaded, implying that the meetings are not held frequently; a common feature of social and political interactions in rural Burkina Faso, where a large proportion of the population is excluded from the decision-making process. Approximately 81% of the respondents expressed dissatisfaction with the fairness of decisions relating to the allocation of benefits from forest product exploitation (the management fund and the village investment fund, both obtained from selling fuelwood).

The most influential variables for the second factor, which explained 18.75% of the variation, were involvement in forest regeneration, and the protection and maintenance of forests through reporting illegal activities within the FMUs to the local State Forestry Service (which may result in a fine). Since these variables imply motivation to preserve and conserve the forest, factor 2 was designated participation in forest conservation. The level of participation in forest conservation was generally high; 68%, 65%, and 51% of the respondents stated that they participated in maintaining firebreaks, forest protection and regeneration, respectively. Among the forest conservation activities, only participation in firebreak maintenance was remunerated because this activity entails significant physical effort, so rewarding such activity could be an incentive for members to participate.

The third factor, explaining 17.51% of the variation, captured four participation indicators related to generating household income, enabling micro-economic activities, creating employment opportunities and benefiting from fuelwood cutting. Since these indicators are related to respondents' household dependence on forest resources for generating income, factor 3 was designated economic benefit for the members. The majority of the respondents benefited economically (received direct benefits) from participating in the forest management program, but to varying extents. For instance, 25%, 13%, 41% and 22% of the respondents regarded

their benefit from fuelwood cutting as minimal, fair, average and high, respectively. With respect to generation of household income, 3%, 24%, 41% and 33% of the respondents expressed the benefits as none, few, fairly large and large, respectively. The extent of participation was dependent on the socio-economic and demographic attributes of the households, as well as the technical support and the forest policy. Socio-economic and demographic attributes accounted for 16.2%, 40.5%, and 1.1% of the variation in participation in decision-making, forest conservation and economic benefits, respectively

Gender, household size, income source, land tenure status and technical assistance appeared to influence members' participation in the program (Table 7). The respondents' household size had a positive effect on participation in decision-making (Factor 1), indicating that heads of large households were more willing to participate in forest management decision-making than other respondents. The heads of such households have a strong motivation to be involved in decisions related to forest management (reflected in attending meetings, agreement on decisions made in meetings and the ability to influence decisions in meetings), since they are also usually rich and powerful and thus may play a significant role in the decision-making process. A highly significant relationship between gender and participation in forest conservation (Factor 2) was found, but only a slightly significant relationship between gender and economic benefit (Factor 3). Male and female respondents experience different situations, which influence their participation in forest management activities, such as reforestation, firebreak maintenance, attending meetings, and involvement in meetings. Indeed, women's social and household obligations combined with socio-cultural norms and values in the Nuni ethnic group often hinder their participation in the forest management program. Women are also felt to be insufficiently physically strong for the hard work of cutting fuelwood (the main source of revenue for the forest management program), although in some FMUs in southern Burkina Faso women are substantially involved in fuelwood cutting despite having less access to the fuelwood market than men.

Table 7. *Estimated regression standardized beta coefficients (β) of the latent variable equations for participation in forest management*

Description	Factor 1		Factor 2		Factor 3	
	Decision making		Forest conservation		Economic benefit	
	β	t-values	B	t-values	B	t-values
Constant		-1.047		0.957		-1.758
Gender	0.103	1.232	0.441***	6.237	0.173*	1.901
Marital status	-0.042	-0.554	-0.118*	-1.842	0.077	0.866
Age category	0.117	1.433	0.059	0.859	-0.046	-0.516
Household size	0.260***	3.230	-0.032	-0.471	-0.038	-0.434
Proportion of female/male	-0.041	-0.564	0.047	0.768	0.008	0.095
Educational level	0.103	1.410	-0.032	-0.513	0.011	0.140
Residence status	0.061	0.495	0.008	0.080	0.126	0.941
Land tenure status	0.080	0.639	-0.20*9	-1.969	0.322 **	2.360
Technical assistance	-0.271***	-3.466	-0.225***	-3.412	-0.061	-0.714
Adequacy of government policy	0.177**	2.392	-0.078	-1.251	0.055	0.680
Adjusted R²	0.162		0.405		0.011	

Statistically significant estimates are indicated by stars * P < 0.10, ** P < 0.05 and *** P < 0.01

Marital status of the respondents had a significant positive impact on participation in forest conservation (Factor 2). This implies that married members were more willing to participate in forest protection and conservation, presumably because they could draw on an additional work force (their families) than single members shouldering all household responsibilities. There was also a significant association between land tenure status and participation; individuals who had inherited land were less involved in sharing economic benefits accrued from the forest management program than farmers who did not own land. This indicates that there is a significant positive relationship between economic benefit and participation, and that the economic benefits of participation appear to be more attractive for non-land owners for whom participation in forest management activities could provide a way of diversifying their livelihood.

Technical assistance from organizations involved in forest management and conservation in the region had a significant negative effect on participation in forest conservation and decision-making, but not on economic participation. This may be interpreted as evidence that in southern Burkina Faso technical aid weakens the desire to participate in forest management programs, probably because respondents do not believe that the training programs related to aspects of forestry such as conservation and improving communication between forest stakeholders would enhance their managerial capacity and their livelihood. The principal reason for the apparent lack of faith in technical assistance could be that while it may be necessary for changing attitudes, it is by no means sufficient to change forest management practices since improving the flow of information to a decision-maker does not necessarily increase his or her capacity to act upon it. Furthermore, voluntary organizations often fail to cooperate with each other and to coordinate their activities in attempts to address forestry and environmental problems. They are, therefore, often drawn into conflicts and unable to act efficiently. Forest policies were found to have a significant and positive impact on decision-making. In Burkina Faso, the participatory forest management policy introduced in 1980, the decentralization process initiated in 1992 and the Forestry Act enacted in 1997, all stress the importance of the participation of local populations in forest management. These policy reforms may to some degree influence members' participation in decision-making processes by both encouraging them to influence decisions and enhancing their aptitude for making decisions during meetings.

5.3 Performance of forest management groups

The performance of four FMGs in terms of economic benefit, forest conservation and decision-making was compared, and the results showed a statistically significant difference in the combined dependent variable (economic + decision-making + forest conservation indicators) among them ($F_{[9, 636]} = 5.32, p < 0.0005$; Pillai's Trace = 0.21). When the ranks for each performance indicator were considered separately, significant differences were observed for economic performance and forest conservation, while performance in decision-making did not vary significantly between FMGs (Table 8). Inspection of the mean scores for each indicator revealed that members of the Sapouy-Biéha FMUs (FMUs 9 and 2-F) reported higher levels of perceived economic performance than members of the Korabou and Ly FMUs, while the perceived performance in terms of forest conservation ranked least in Ly compared to Sapouy-Biéha and Korabou (Figure 2). Members of Sapouy-Biéha FMUs benefited well from fuelwood sales, and the forest management program enabled them to improve their household income and to start up micro-economic activities more than members of the Korabou and Ly FMUs (Figure 3).

The performance scores for forest regeneration and forest protection were slightly higher for Sapouy-Biéha FMUs than for the Ly FMU. Although perceived differences in decision-making processes were generally non-significant, further analysis of each indicator of the decision-making process revealed significant differences in agreements on decisions during meetings (Table 8). The scores for this indicator showed that there is better agreement on decisions in the Sapouy-Biéha FMUs than in the Korabou and Ly FMUs. As a whole, the score for economic performance was higher than those for forest conservation and decision-making.

Table 8. Summary of MANOVA output for comparing significant differences in economic, forest conservation and decision-making performances among four forest management units in Southern Burkina Faso

Performance indicators	F _(3, 212)	P-values*	Effect size
Economic	13.56	<0.0005	0.161
Benefit from fuel wood cutting	8.04	<0.0005	0.102
Exploitation of NTFPs	2.81	0.036	0.038
Generating household income	20.80	<0.0005	0.227
Creating employment opportunity	5.43	0.002	0.071
Enabling micro-economic activities	6.27	<0.0005	0.081
Forest conservation	4.68	0.003	0.062
Forest regeneration	5.52	0.001	0.072
Maintenance of firebreaks	2.99	0.032	0.041
Forest protection	4.30	0.006	0.057
Decision-making processes	3.19	0.025	0.043
Attendance to meetings	2.18	0.092	0.030
Frequency of meetings	1.16	0.325	0.016
Suggestion during meetings	3.39	0.019	0.046
Ability to influence decisions in meetings	1.98	0.118	0.027
Agreements on decision during meetings	5.82	0.001	0.076
Fairness (transparency) in benefit allocation	3.16	0.026	0.043
Forest monitoring & evaluation	Np	Np	Np

*significant based on Bonferroni adjusted probability level of 0.01. Np = computation was not applicable due to similar ranking for this variable in all FMUs.

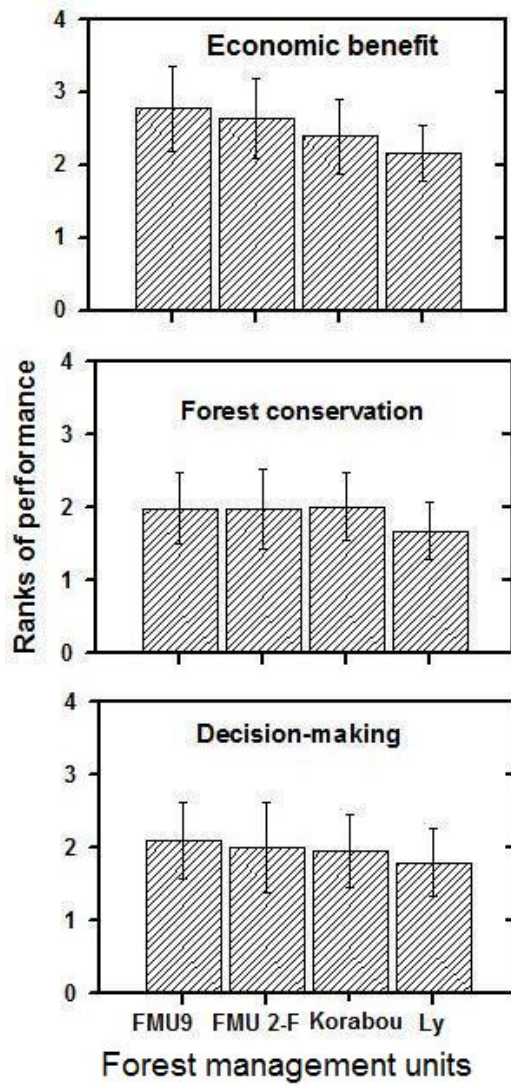


Figure 2. Scores (1-4) of overall performance forest management units in terms of economic benefit, forest conservation and decision-making processes (mean \pm SD).

The variation in performance among FMGs is related to access to the fuelwood market, which significantly influenced the economic performance ($r = -0.996$; $p = 0.004$) and the decision-making process ($r = -0.986$; $p = 0.014$). FMUs that are distantly located from the fuelwood market (Korabou and Ly) performed less well than those close to the main fuelwood market (Sapouy-Biéha). Members of the Sapouy-Biéha FMUs reported higher scores for economic performance than those of the Korabou and Ly FMUs, particularly for benefits accrued from fuelwood harvest and sales. The Sapouy-Biéha FMUs are located close to the main road connecting the province with the capital, Ouagadougou, where the demand for fuelwood is high. Distances to forests and markets are among common external factors that might have enhanced opportunities to increase the scale of fuelwood production. The interviewed members perceived that group size does not have any influence on the effectiveness of the participatory forest management program, but ethnic dissociation was perceived as an essential condition for effective performance.

5.4 Issues and challenges to decentralization of forest management

The decentralization process in Burkina Faso started with a government initiative following ratification of the constitution on 2 June 1991. The first municipal elections were held in 33 urban areas in 1995, followed by elections of new councils in these municipalities in 2000 and the creation of 16 additional municipalities, resulting in the creation of 49 urban municipalities in total. Further decentralization reforms, referred to as Texts of Orientation of Decentralization (TOD), were passed on 6 August 1998 and modified in 2001 and 2003. Proclamation No. 55/2004, relating to the General Code of local Communities, was adopted by the National Assembly on 21 December 2004. This law officially sanctioned communalization of the territory in accordance with the constitution, leading to the establishment of 302 rural municipalities/communes in addition to the existing 49 urban municipalities and 13 regional councils. The first local election was organized in April 2006.

The current legislative framework of decentralization in Burkina Faso has established three levels of elected representatives, known as “*collectivités territoriales*”. At the village level, Village Councils for Development have been established to help develop and implement communal plans for

development. Each Village Council for Development includes an executive committee of 12 members, two of whom are responsible for environmental issues, including forestry. At the district level, municipalities or communes have been established, each municipality having an executive committee of six elected members, including a mayor, two vice mayors and three members responsible for special commissions. The executive committee focuses on local development, including land management, economic development, planning, environmental protection and the management of forest resources. At the regional level there is a regional council, including an executive committee with six members. The General Code of Territorial Communities theoretically grants autonomous power to the territorial and administrative entities (communes and regions) for the planning and implementation of local development programs. The central State, through the Ministry of Territorial Administration and Decentralization, organizes and controls the decentralization process at all levels. The State, acting through the Ministry of Environment and Forests and its Forest Service at various levels, was the main actor in forest management up until 1980. As outlined above, when the participatory forest management program was launched in the late 1980s, the local people were organized into cooperatives of FMGs, and entered into management agreements with the State Forest Service. They mainly implement management plans devised by the Forest Service with support from the NGOs and research institutes, and benefit from the revenues generated by the program (mainly marketing of fuelwood). Thus, the 1993 decentralization law has brought new actors (mainly representatives of rural communes) into the forest management domain.

Decentralized forest management is not yet fully exercised in Burkina Faso. There are a number of issues and challenges that compromise its effective implementation (Table 9). The case study revealed that the most important issues related to the resources-base are the lack of clear demarcation of the boundaries between forest management units and the village farmlands as well as between physical boundaries of the forest resources and the administrative limits of the communes. The unclear demarcation or the absence of boundaries between the FMUs and the village farmlands may lead to the encroachment of farming into the FMUs. Furthermore, decentralization aims at transferring resources to the municipalities, and the fact that the physical boundaries of the forest resources do not coincide with the administrative limits of the communes is a major challenge for the implementation of decentralized forest

management. The pressure on the existing forest due to clearing for agricultural purposes by both local people (migrants) and large-scale agricultural investors is perceived to be the most important issues pertaining to the resource-base. A major problem associated with agri-business is that some investors gain authority to clear large areas of forests and convert them into farm lands against the will of the local population through the help of politicians. In some cases, the clearing of forests seems to be guided by the desire to own lands that they can claim ownership of, rather than any immediate wish to use the land for farming.

With regard to accountability in the current participatory forest management program, two major categories of issues can be identified: those related to fuelwood marketing and those pertaining to the allocation of revenues. In the case of fuelwood marketing, overloading of trucks transporting fuelwood by truck drivers in an attempt to secure extra wood for their own benefit and bribing tax collectors to avoid paying forest taxes are main issues leading to corruption. The second issues related to accountability are inappropriate allocation of revenues and lack of auditing of the management fund. The management fund (27.3% of the revenue from fuelwood marketing) is intended to be used to control bush fires, pay for reforestation activities and remunerate the technical staff. This fund is rarely re-invested to maintain forest sustainability, and it has never been audited, leading to suspicions of nepotism and corruption, which will eventually spark conflicts between the Forest Service, forest user groups and elected bodies (mayors and councillors).

Table 9. *Issues and challenges to decentralization of forest management raised by focus group discussion participants in decreasing order of degree of importance (1 highly important and 6 least important).*

A) Resource-base

Issues	EB	TS	GR
Mismatching between physical boundaries of FMUs and administrative boundaries of communes	1	4	3
Lack of demarcation of boundaries between FMU areas and village farm lands	2	5	5
Weak legal protection of the FMUs	5	3	1
Pressure on the forest due to high immigration	4	2	4
Pressure on the forest due to expansion of agri-business	3	1	2
Emphasis on a few forest products (mainly firewood), leading to partial benefit-sharing from the forests	6	6	6

B) Accountability

Issues	EB	TS	GR
Issues related to fuelwood marketing			
Overloading trucks with fuelwood	3	1	1
Failure to pay taxes	1	2	3
Communication deficiency among support groups	2	3	2
Issues related to revenues			
Misuse of revenues	1	1	1
Lack of auditing of management funds	2	2	2

C) Transparency

Issues	EB	TS	GR
Poor flow of information between members of FMUs	1	1	1
Lack of subsidiarity	2	3	2
Infrequency of FMG meetings	3	2	3

EB: Executive bodies; TS: Technical Support group; GR: Grass-root actors

Table 9 (continued)

D) Empowerment			
Issues	EB	TS	GR
Lack of competence at the local level	2	1	3
Transferring management autonomy to territorial communes	4	5	6
Abuse of power by some authorities	5	6	5
Limited participation in decision-making processes	3	4	1
Limited human resources at the local government level	6	3	2
Financial constraints at the local level	1	2	4

EB: Executive bodies; TS: Technical Support group; GR: Grass-root actors

Concerning transparency in the existing forest management program, a lack of exchange of information between members of FMGs appeared to be a major issue. The local people do not have the same level of accessing information due to their illiteracy and the infrequency of meetings. Indeed, meetings are so infrequent and ordinary members of the FMGs participate less in the rare meetings, so the elites control the decision-making process, which in turn might limit the flow of information to ordinary members of the FMGs.

With regard to devolution of power to the local level, the lack of competency at the local level, financial constraints and the tradition of elite-controlled decision-making processes are the most important constraints for effective local governance. Thus, the transfer of management autonomy to territorial communes appeared to be premature by all discussants. The potential fear of power-abuse by some local level authorities when the decision-making power is devolved to them appeared to all focus groups as an issue of least importance.

6 Discussion

Forest resources are amongst the most vital components of livelihoods and development opportunities in rural Africa (Cavendish, 2000). Hence, securing access to, and control of, forest resources is crucial for prospects of rural poverty reduction (Andersson, 2002; Ribot, 2004). Access to forests is influenced by, and dependent on, forest governance (Kowero *et al.*, 2003). In most francophone West African countries, the traditional forest management policy, in effect from the colonial time up until post-independence, separated rights and users into two distinct categories – commercial and subsistence. The Forest Service and the elite were typically granted rights to harvest, and market commercially valuable forest products, while the poor rural people could access forest products with little or no commercial value under a system of usufructuary rights (Ribot, 1999). These use rights could be revoked at any time if the Forest Service or administrators allocated the forests to commercial users and/or in pursuance of implementing forestry regulations. For example, in 1990 the Forestry Code in force in Burkina Faso prohibited grazing in the forest, thus limiting access to forests for grazing livestock (**Study I**), despite emerging empirical evidence that grazing does not have detrimental effects on either herbaceous (Savadogo *et al.*, 2007) or ligneous (Zida, 2007) components of the forest ecosystem.

Traditional rules and regulations also imposed (and continue to impose) restrictions on use rights. The designation of sacred forests in some of the villages prevents access to forest products in some places. Sacred forests are sanctuaries where the community elders are buried, places where sacrifices to ancestors are made, and other traditional rituals are performed, and only indigenous married men are allowed to enter. According to traditions in Burkina Faso, land rights are held by men or kinship groups controlled by men, women do not have direct rights over land, and planting trees on

rented lands is traditionally prohibited in southern Burkina Faso. Local custom also dictates that only those who have family rights to land (indigenous people) can plant trees (**Study I**). This is because planting trees on rented land has been perceived as powerful evidence for land claims. Consequently, women and migrants are forbidden by custom to plant trees, to prevent them from subsequently claiming the land (Fortmann & Bruce, 1988). Furthermore, according to the customary rules, people have access only to woodlands that belong to their own lineages or families. Therefore, migrants are not always allowed to harvest valuable products, such as seeds of *P. biglobosa*, because of their socio-economic importance. Such traditional customs and norms are still important, since they are believed to take precedence, generally, over formal rule-based systems in determining the use of common property resources, such as forests (Campbell *et al.*, 2001). Hence, the State control of, and customary rights over forests, have disenfranchised the poor rural populations of their citizen's right to benefit from equitable distribution of the natural asset (forests). Clearly, the poor need these natural assets to diversify their livelihood and to use as a safety-net during hard times. Security of tenure (including rights of alienation, management, and benefits) and access to resources are key issues that policies intended to enfranchise the poor to equitable access need to address. Positive affirmative actions are required to support vulnerable groups, as access to forest resources has been found to relate to the socio-economic and demographic attributes of the households (**Study I**).

During the past three decades, the management of natural forests has progressively moved away from the traditional protectionist approach to participatory and decentralized forest management in many developing countries. This paradigm shift has been propelled by emerging beliefs that those who stand to benefit directly from the sustainable management of forest resources can best manage the resource (Nelson & Agrawal, 2008), and that it is virtually impossible to manage the environment from the centre without (i) the active support and participation of local communities, and (ii) assuring them of direct benefits from sustainable management of the forest resources. Consequently, participatory forest management has been pursued as an approach to some form of popular participation in natural resources management through various community-based natural resources management approaches in many developing countries (Sunderlin *et al.*, 2008) In some of these countries, the changes in rights and powers to manage forests seem to fulfill conditions that should theoretically enable improved forest management (Bromley, 1991), enfranchise local populations (Wily, 2001), legitimize local authorities (Brockington, 2007) and have

positive livelihood effects (Lund & Treue, 2008) However, a growing body of literature indicates that, in most cases, popular participation is reflected more in government and donor discourses than in the experience of rural communities (Campbell & Shackleton, 2001; Ribot, 2004 ; Tacconi *et al.*, 2006). This is also the case in Burkina Faso, where popular participation in forest management is very limited in reality (**Study II**). The major tenets of popular participation theory are that local people influence the direction and execution of the development or management of a natural resource to enhance their well-being in terms of income, personal growth, self-reliance or other values (Sensu Little, 1994).

However, the current participatory forest management program in Burkina Faso gives rural populations little choice about how to manage the forest resources, and their participation is relegated to implementing forest management plans drawn up by the Forest Service. The decision-making process is controlled by the elite and State Forest Service, while members of the FMGs have little influence. To date, permits for harvesting and marketing forest products (mainly fuelwood) are still under Forest Service control, and allocated to powerful urban-based merchants. This arrangement has forced the local management groups to sell to the limited number of State-designated fuelwood merchants, despite seeking better access to urban markets (Delnooz, 1999). Undeniably, the local people have benefited from their share of revenue accrued from fuelwood sales, but it is tiny (about 1.65 Euro per m³ of fuelwood cut). Members' self-assessments of performance provided further evidence that the lack of access to fuelwood markets is a major factor influencing the economic performance of the participatory forest management program in Burkina Faso (**Study III**). This confirms Agrawal statement according to which socio-economic condition affect users' ability to manage a resource successfully (Agrawal, 2001, Agrawal 2003). As a whole, popular participation in forest management in the country can be best described as passive (*sensu* Agarwal, 2001) or resource participation (*Sensu* Buttoud, 1999).

Another striking feature of the participatory forest management program in Burkina Faso is that the level of participation is not homogenous amongst members of the FMGs (**Study II**). Members with large households are more interested in participating in forest management decision-making than other respondents, most likely due to their dependence on forest resources to diversify household livelihoods, as they may find it difficult to access alternative sources of subsistence. Heads of large households are also usually rich and powerful and thus may play a significant role in the decision-making process (Maskey *et al.*, 2006). Gender appears to be important for

some aspects of participation in southern Burkina Faso, as reported for most developing countries (Hunter & Hatch, 2004). Accordingly, women have limited participation in community organizations in southern Burkina Faso due to their social and household obligations combined with socio-cultural norms and values of the Nuni ethnic group, which often present obstacles to participation in the forest management program. In rural Burkina Faso, women are responsible for diverse household duties, such as child care, fetching water, cooking food and farming. Further, in the study area, women are not traditionally allowed to speak in front of men publicly, which prevents them from coming forward in participatory efforts, while men are considered to be responsible for village development and governance. Thus, norms shape divisions of labour between the genders and the role of women as care-givers and nurturers often prevents them from sparing time from domestic duties to participate in management activities or attend meetings (Nuggehalli & Prokopy, 2009). Fear of losing standing in the community may also inhibit women from attending meetings related to collective action, since these are often held in publicly segregated spaces (Agarwal, 2000). Sell (1997) stressed that women cooperate more often in all-female groups since they feel more empowered with other low status actors than when they are a minority in a mixed-gender group. In contrast, men cooperate more in a largely female group because they expect to be able to influence group decisions more strongly in such contexts than if other actors are equally powerful, as in an all-male group. It is also thought that women are not sufficiently physically strong for the hard work of cutting fuelwood, although in some FMUs in southern Burkina Faso women are substantially involved in fuelwood cutting, despite having less access to fuelwood markets than men (Zougouri, 2008). Popular participation in forest management in Burkina Faso can, thus, be best described as “passive” (Sensu Agrawal, 2001) or “resource” participation (Sensu Buttoud, 1999), in which participants are informed of decisions *ex post facto*; or attend meetings and assist in decision-making without influencing the decisions. Thus, overall, the move towards participatory forest management has done little to establish new rights over forest resources for the vast majority of the rural people.

Decentralization is viewed as a promising means of institutionalizing and scaling up the popular participation that makes participatory management effective. It enhances use and management efficiency and equity while reducing conflicts over forest resources (Ribot, 2002b; Ribot, 2009). Emerging experiences suggest that decentralized forest management can result in effective control of forest utilization, leading to improvements in tree growth (Lund & Treue, 2008), ecosystem functions and quality (Carter

& Gronow, 2005), resource status (Kumar, 2002; Sauer & Abdallah, 2007), and the sustainable management of forest resources by the local people (Ribot, 2004). It also contributes to poverty reduction through improving access to forest products for consumption and trading (Cavendish, 2000; Larson, 2005) and finance for local public services (Lund & Treue, 2008). Finally, decentralized forest management is believed to lever good governance at the local level if meaningful powers are devolved to democratically elected and downwardly accountable decision-making entities (Ribot, 2004). Almost all developing countries are undertaking decentralization reforms (Ribot, 2004; Hobley, 2007), with varying motives. Generally, most donors and governments justify decentralization as a means for increasing access, use, management, voicing of claims and concerns about natural resources among communities.

In Burkina Faso, decentralization started with a government initiative following ratification of the constitution on 2 June 1991, and in 1994 a National Commission for Decentralization was established. However, despite the general decentralization reform, its implementation in natural forest management is in an early phase – a common feature in parts of Sahelian West Africa where local elections have been held (Ribot, 2002b; Ouédraogo, 2003). Several issues still need to be resolved to scale-up the current participatory forest management programs into a more decentralized forest management regime (**Study IV**). The FMUs are not clearly demarcated, and in some cases they fall within several communes and villages, which creates difficulties in devolving control of resources to a specific local administration and may spark conflict over forest resources. Knowledge of the resource-base and clear boundaries in common-pool forest management schemes is essential to minimize conflicts over limited resources (Larson, 2003; Wily, 2003; Johnson & Nelson, 2004). The decentralization reform brings new actors, namely local elected councillors into the picture, compared to the participatory forest management program, in which the State (through its Forest Service) and the local people are the main actors. The new actors have conflicting power interests over decision-making regarding the management of the forests, making devolution of power challenging. In principle, the local structures, such as the FMGs and the Village Development Councils, should be the bodies empowered to make decisions. Such devolution of decision-making power has a higher probability of failure if lower level authorities lack both financial and administrative ‘powers and resources’ (Manor, 1999), which is the case today in Burkina Faso. The institutional strength of the FMGs is weak, partly due to a lack of transparency and accountability, and partly to poor local competence. Further, there are already signs of corruption within the

existing forest management program, due to the lack of auditing of the program's revenues, and poor information flows among members due to infrequent meetings and elite-control of the decision-making process. There is also a propensity for central government to maintain its control over the forest resources, particularly through the heavy involvement of the Forest Service in the affairs of the FMGs, to the extent of deciding matters related to the production and marketing of forest products, controlling fuelwood marketing through issuing licenses to fuelwood wholesalers, and revoking management agreements made with the local people if some perceived violations of the agreements occur. These issues need to be redressed in order to achieve the benefits that can be accrued from decentralization reform. Towards this end, recommendations are given in the Conclusions below.

7 Concluding comments and recommendations

Rural villages in Burkina Faso are not homogeneous entities that can be isolated and identified by a single objective or common interest. The investigations of the determinants of access to forests resource revealed that access to forests differed among households, thus local management institutions need to take these variations into account to ensure that the livelihood needs of the poor are met. Further, the findings indicate that factors related to decision-making, forest conservation and economic benefits are the most important determinants of local people's participation in forest management programs in southern Burkina Faso. Despite the decentralization policy in force in the country since 1992, the State Forest Service is heavily involved in the decision-making process. This considerably limits the active participation of local people in decision-making. Meaningful transfer of power to locals is crucial for participation, so power should be devolved to the locals, particularly direct forest users, not only the group committee members as currently the case in the forest management unions and groups. To some extent, participation in forest management activities is also influenced by gender, household size, land tenure status, marital status, and forest legislation and implementation of forest laws and regulations. The performance of the participatory forest management program was also found to vary among units, depending on their proximity to roads and markets (which plays a primary role in the economic performance of common pool forest management). Members' perception of the participatory forest management program seem to focus on their ability to generate income to support their livelihood, while less emphasis is placed on forest conservation.

There are disparities between the decentralization policy and practice on the ground. Policy has been formulated and acts have been passed, but not enforced on the ground, explaining the retention of central government power over forest resources. It was found that the devolution of decision-making power to the local government and people at the local level is not yet effective. To enhance the outcome of the participatory forest management program in southern Burkina Faso, the following strategies could be considered to foster sustainable forest management:

- a) Due to the lack of a coherent balance of formal and traditional tenure rights governing forest use, more attention should be paid to securing user rights and empowering forest users by allowing direct involvement of vulnerable and marginalized groups (women and migrants) in forest management activities and thus their access to forest products.
- b) Women's participation in the FMUs should be enhanced, either by creating women's groups within the FMUs and delegating them to work on forest regeneration, with remuneration, or by establishing women's groups focused on NTFP collection and selling, particularly in Ziro province.
- c) Existing policies on participatory forest management should be revised to improve the hierarchical administrative structure of the FMGs and ensure equitable benefit sharing mechanisms.
- d) Membership of the management groups, and thus willingness to participate, should be reinforced by increasing incentives. For instance, forest conservation activities should be improved through allocating part of the management fund to the remuneration of actively participating members.
- e) The economic performance of the FMUs could be enhanced by improving the quality/accessibility of the roads and thus the FMUs' access to markets, or allowing free fuelwood markets. Part of the management fund could be allocated to the improvement of the quality of roads.
- f) Re-demarcation of the boundaries of the forest management domains/area and their demarcation in each municipality is required to avoid conflicts between local governments and local communities.

g) Adjustments to the decentralization reforms and revisions of the regulations governing the forest management groups are required. This could allow the transfer of forest management power to local levels more effectively.

h) The studies presented in this thesis focused on the social dimension of the participatory forest management groups. To get a complete picture of the performance of the program, data on the stocking density, the regeneration status of selective cut stands and other factors influencing forest recovery are needed. Therefore, an inventory of the forest management units should be made and the management plan revised accordingly.

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Appendix 1. Questionnaire for Study II

Factors influencing participation in forest management program in Southern Burkina Faso

Date: _____ The investigator's name: _____
Village: _____ Forest Management Unit: _____

I. Identification and socioeconomic characteristics of the household

- 1.1. Household number: _____
- 1.2. Name of the household head: _____
- 1.3. Name of the respondent: _____
- 1.4. Ethnicity of the respondent:
a) Nuni b) Mossi c) Walad) Dagara e) Fulani f) Sissala other _____
- 1.5. Gender: Male Female
- 1.6. Age: _____
- 1.7. Educational level:
a) Illiteracy
b) Primary school
c) Secondary school
d) Religious education (Coran)
e) Adult education
f) Agricultural training
- 1.8 What is your residence status?
Native Migrant

1.9. How does the household own the land (tenure status)?

a) Inheritance I__I b) Rent I__I c) Gift I__I d) buying I__I

1.10 How many people live in your household?

a) Less than 5 people I__I b) 6- 10 I__I

c) 11- 15 I__I d) 16- 20 I__I e) More than 20 people I__I

1.11 Sex ratio in the household?

a) Number of females

b) Number of males

1.12. What are your sources of income?

a) Selling of non-timber forest products I__I b) Selling of cash crop I__I

c) Selling of livestock I__I d) Off-farm labor (salary, handicraft, etc.) I__I

1.13. Do you receive any technical assistance from the forest office?

Yes, always ____ Yes, Partly____ No____ No opinion____

II. Participation in forest management

2.1. Rank your involvement in forest management activities (1 is least and 4 is high)

Activities	Ranks (circle the answer)			
Involvement in keeping firebreaks	1	2	3	4
Involvement in forest protection	1	2	3	4
Involvement in forest regeneration	1	2	3	4

2.2 Rank your attitudes towards decision-making process (1 bad and 4 very good)

Decision-making processes	Ranks (circle the answer)			
Agreements on decision during meetings	1	2	3	4
Attendance of meetings	1	2	3	4
Involvement in decision on forest monitoring & evaluation	1	2	3	4
Suggestion during meetings	1	2	3	4
Ability to influence decisions during meetings	1	2	3	4
Agreements with decision during meetings	1	2	3	4
Fairness of benefit sharing	1	2	3	4
Frequency of meetings	1	2	3	4

2.3 Rank the benefits you get from the forest management activities from nothing (1) to large benefit (4).

Benefits	Rank (circle the answer)			
Generate household income	1	2	3	4
Create employment opportunity	1	2	3	4
Enabling micro-economic activities (e.g. start up of small shops, other business or off-farm activities using money gained from management activities)	1	2	3	4
Collection of collecting fuelwood	1	2	3	4
Involvement in fuelwood cutting	1	2	3	4

2.4 Does government policy (forest law, decentralization, etc.), influence your participation in forest management activities?

Negative influence I__I no influence I__I positive influence I__I

2.5 If the government policy has an influence, negative or positive, list them

Appendix 2. Questionnaire for Study III

Date: _____ The investigator's name: _____
Village: _____ Forest Management Unit: _____

I. Identification of the respondent

1.1. Household number: _____

1.2. Name of the respondent: _____

II. Members' perceptions about collective action

2.1. What are the problems in your village? (Rank the problems from the less important (1) to the most important (4))

- | | | | | |
|--|---|---|---|---|
| a). Development issues (lack of roads, health, unemployment, etc.) | 1 | 2 | 3 | 4 |
| b). Drought | 1 | 2 | 3 | 4 |
| c). Water scarcity | 1 | 2 | 3 | 4 |
| d). Problem related to forest (fire, lack of grazing lands, shortage of fuel wood, etc.) | 1 | 2 | 3 | 4 |
| e) Other | 1 | 2 | 3 | 4 |
| f) Can't say | I | I | | |

2.2. Do you think a large group/cooperative size is able to successfully cooperate in collective action than a small one?

- a) Strongly agree I__I
b) Agree I__I
c) Somewhat agree I__I
d) Somewhat disagree I__I
e) Disagree I__I
f) Strongly disagree I__I
g) Can't say I__I

2.3. Do you think ethnic dissociation is better at working together in collective action ethnic association?

- a) Strongly agree I__I
- b) Agree I__I
- c) Somewhat agree I__I
- d) Somewhat disagree I__I
- e) Disagree I__I
- f) Strongly disagree I__I
- g) Can't say I__I

II. Assessment of the cooperative performance

Rank your perception about the ability of your cooperative to allow the following advantages/compensation to his members (rank the answer when 1 = bad, 2 = satisfactory, 3 = good and 4 = very good.)

Participation Indicators	Ranking			
Decision-making indicators	1	2	3	4
Agreements on decision during meetings	1	2	3	4
Attendance to meetings	1	2	3	4
Ability to influence decisions in meetings	1	2	3	4
Suggestion during meetings	1	2	3	4
Fairness and transparency in income allocation	1	2	3	4
Involvement in decision on forest monitoring & evaluation	1	2	3	4
Frequency of meetings	1	2	3	4
Indicators of forest conservation	1	2	3	4
Involvement in keeping firebreaks	1	2	3	4
Involvement in forest protection	1	2	3	4
Involvement in forest regeneration	1	2	3	4
Economic indicators	1	2	3	4
Generate household income	1	2	3	4
Enabling micro-economic activities	1	2	3	4
Create employment opportunity	1	2	3	4
Involvement in fuelwood cutting	1	2	3	4
Exploitation of NTFPs	1	2	3	4

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French summary (résumé)

Évaluation du Programme de Gestion Participative des Forêts au Burkina Faso

Dans de nombreux pays en développement il ya eu un changement de paradigme dans les stratégies de conservation et de gestion des forêts, partant du contrôle centralisé de l'Etat vers des programmes communautaires, avec le double objectif de favoriser la gestion durable des forêts et la réduction de la pauvreté. Au Burkina Faso, les réformes politiques différentes ont été introduites et des tentatives ont été déployées pour déléguer les droits d'utilisation et de gestion des forêts aux communautés locales depuis les années 1980. Toutefois, on peut se demander si la participation des communautés a conduit à l'amélioration de leurs moyens de subsistance et à la bonne gouvernance. Avec l'objectif de fournir une plate-forme pour développer des stratégies qui favorisent la gestion durable des forêts, les études sur lesquelles cette thèse est basée examinent le programme de gestion participative des forêts (GPF) dans le sud du Burkina Faso en termes d'accès des populations aux produits forestiers, de participation des membres, leur perceptions du programme, et les défis relatifs associés observés dès les premières étapes de mise en œuvre de la décentralisation politique. Des données quantitatives et qualitatives ont été recueillies par enquêtes auprès des ménages, des groupes de discussion et la revue de la littérature. Les résultats montrent que les facteurs liés à la prise de décision, la conservation des forêts et les avantages économiques sont les plus importants déterminants de la participation. En outre, les déterminants de l'accès aux ressources forestières diffèrent entre les ménages, par conséquent, les institutions de gestion locales doivent tenir compte de ces variations pour s'assurer que les besoins de subsistance des pauvres sont satisfaits. Malgré la politique de décentralisation en vigueur dans le pays depuis 1992, le Service des Forêts

est toujours fortement impliqué dans le processus décisionnel. Cela limite considérablement la participation active des populations locales. Les résultats montrent également que, dans une certaine mesure, la participation aux activités d'aménagement forestier est influencée par le genre, la taille démographique du ménage, le statut foncier, l'état matrimonial, ainsi que la législation forestière en vigueur et la mise en œuvre des lois et règlements forestiers. La performance des groupements de gestion forestière, est fonction de leur proximité des routes et de l'accessibilité aux marchés. La perception des membres de groupements de gestion forestière semble se traduire à travers leur capacité à générer des revenus pour subvenir à leurs besoins, tandis que moins d'accent est mis sur la conservation des forêts. Pour améliorer les résultats du programme de GPF, les stratégies suivantes pourraient être envisagées: la garantie des droits des utilisateurs et l'autonomisation des utilisateurs de la forêt par la promotion de la participation directe des groupes vulnérables et marginalisés (les femmes et les migrants), l'augmentation des mesures incitatives à la participation, et le renforcement de la décentralisation après avoir relevé les défis pour améliorer la bonne gouvernance et veiller au partage équitable des avantages.

Mots-clés: Burkina Faso, dépendance vis-à-vis des forêts, ressources communes, droits de propriété, genre, action collective, participation, responsabilisation, décentralisation

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