

*Determinating Factors for a Successful Establishment of Participatory
Forest Management: A Comparative Study of Goba and Dello
Districts, Ethiopia*

By

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The master thesis is carried out as a part of the education at the University of Agder and is therefore approved as such. However, this does not imply that the University answers for the method that are used or the conclusion that are drawn.

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May 2010

Abstract

A Participatory Forest Management project run by Farm Africa and SOS Sahel Ethiopia in Bale region is operational since 2006 in four pilot districts (Goba, Dello, Harrana and Nenesebo). The establishment of the project has turned out to be a success in some sites and a failure in others. The objective of this study was to explore factors that explain successful establishment of the programme thereby assessing the effects of economic, social and biophysical factors on participation. Data were collected from 80 household respondents as well as from interviewees and focus group discussions from different sampling units/groups as well as secondary documents. Descriptive statistical tools such as two-sample t test, Pearson chi-square test and correlation coefficient were worked out to determine the relationship between variables. A logistic regression model was used to determine the relative importance of variables. From the economic factors, annual income, income from forest, and understanding the aim of the livelihood diversification programme were found to have a significant effect on participation. The two social variables used in this study perception/understanding about the Community Based Organization and household size are insignificant in their power to influence household decision on participation. From the biophysical factors, *hamlet*, a place where the respondents reside, is found to have a strong power to explain community decisions to participate in Participatory Forest Management. The remaining biophysical factors, namely distance from market and distance from forest have insignificant effect on the decision whether to participate or not. From this study in general, we can infer that increasing income (it could be forest income or total income) and changing residence of the society can increase the likelihood of household participation in PFM.

Key Words: Community Forestry, Deforestation, Livelihoods, Sustainable Development, Participation, Forest Management, Bale Zone, Ethiopia

Acknowledgements

All praises to **The God Almighty** who has created this world of knowledge for us. He is The Gracious and The Merciful. He bestowed man with intellectual power and understanding, and gave him spiritual insight, enabling him to discover his “Self” know his Creator through His wonders, and conquer nature. Next to him, I thank his mother **Saint Mary** who is an eternal torch of guidance and knowledge for the whole humankind. She prays, blesses, protects and intercedes for us sinners. AMEN!

I am deeply thankful to my advisor, **Associate Professor Christian Webersik (PhD)**, for his persistent help in all the steps of the thesis, from title selection to writing the final report. His way of teaching, continuous guidance, feedbacks, advices and encouragements have been truly exceptional and learnable. Besides, his support, constructive criticisms, flexibility and kindness inspired me greatly and helped me to successfully complete my MSc program.

I am specially grateful and thankful to the Norwegian Agency for International Development (NORAD) for granting me the fellowship to study at University of Agder, Norway. I would also like to extend my gratitude for Farm Africa and SOS Sahel for the financial assistances and for the accommodations; they have provided me with in the study area during fieldwork, and especially to Ben Irwin and Lulu. I am grateful to the residents of the study sites who gave me their precious time to discuss about Participatory Forest Management, answering the questionnaires and replying many queries.

I am very grateful to my best friend Tsion who took her time to patiently review my thesis. My heartfelt thanks also go to my friends Tadesse, Bereket, Muhamed, Samuel, and Girma for their hospitality and cooperation. In addition, it would not be justified if I do not mention the support of Carolyn, Abebe, Alemat, Charlie, Hailemichael, Tesfay, Kahsu, Giotom, Abadi, Solomon, Shambel, Anteneh, Bihon and Gebremedihin. I thank you all for taking your precious time to read and provide me with valuable comments.

Finally, my warm thanks and love go to my father, my mother, my brothers, my sister and my ant (Bogalech) without whom I would not be the person I am today. My work is the result of your perseverance. **I will always love you and remain grateful to you!**

Alemtsehay Jima

Declaration by Candidate

I hereby declare that the thesis:

Determinating Factors for Successful Establishment of Participatory Forest Management: A Comparative Study of Goba and Dello District, Ethiopia has not been submitted to any other Universities than the University of Agder for any type of academic degree.

Alemtsehay Jima

Mekelle, Ethiopia, 31st May 2010

Date

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List of Abbreviations

| | |
|----------|---|
| CBO | Community Based Organization |
| FARM/SOS | Partnership between FARM Africa and SOS Sahel Ethiopia |
| FAO | Food and Agricultural Organization |
| GDP | Gross Domestic Product |
| NGOs | Non -Governmental Organizations |
| NTFP | Non-Timber Forest Product |
| MDGs | Millennium Development Goals |
| PFM | Participatory Forest Management |
| UN | United Nations |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific, and Cultural Organization |
| ABRDP | Arsi-Bale Rural Development Project |

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Hundred years ago, about 40% of land was covered by forest in Ethiopia whereas only less than 3% of the land is covered by forest currently (Bedru, 2007). The proportion of lost forest cover is almost the same with the size of the Northern European country, Sweden. The major reason behind degradation of forests is human interference (such as expansion of agricultural land, grazing, firewood) and poverty (Bedru, 2007).

In addition to the above factors, the forest management administration over the last 50 years in Ethiopia has negatively affected the forest resource by restricting local communities' access and user rights. After 1941 emperor Haile Selassie declared a law to privatize land and limit access to forest land. This proclamation was in operation until the Derg regime came to power. In 1975, the Derg regime came into power with a new proclamation, nationalizing lands and putting administration of land under highly centralized system. The new rule, which is a proclamation on regulation, by Derg resulted into open access to the resource. The proclamations in the two regimes did not save the country forest resources from degradation as majority of the lost forests were destroyed in this period. In 1991, the fall of the Derg regime further devastated the environment. This is because the new government, Ethiopian People's Revolutionary Democratic Front, was not able to control the country until 1993 except in Tigray region. Hence, during this period, nobody was in charge of managing the natural resources of the country and this situation further devastated the natural forests. In 1994, the new government issued a new proclamation, which was unimplemented because of the subsequent decentralization programme (Bedru, 2007; Gebremdhin, 2008).

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The forestry sector was restructured at country level several times over the last 30 years. In the 1980s, it was established as a forestry department with a total number of employees of 60. In 1995, the department was expanded to ministry level with a total staff of over 300 and in 2004; it was reduced to a small section with 10 employees. Recently, the forestry sector has got much attention at regional level. The Oromia National Regional State, for instance, has the largest forest resource in the country and has pioneered the establishment of a new management initiative system to control the degradation of forests. Accordingly, in 2007 the Oromia Forest Supervising Agency was established to coordinate the establishment of eight forest enterprises across the region. These enterprises are mainly aimed at capturing and merging the effort of community based forest management and government owned projects (FARM/SOS, 2008).

International Non-Governmental Organizations (NGOs) like the German Technical Cooperation (GTZ), FARM Africa and SOS Sahel implement the community based forest programmes in the region in collaboration with the national regional government. GTZ is the first international NGO to implement this programme in the region (Adaba-Dodola area in Bale zone) in the late 1990s. The FARM/SOS Participatory Forest Management (PFM) programme has been operational in Ethiopia since 2002 in the forest of Bonga, Chilimo, Borana and Bale. The outcome of this programme has turned out to be a success in some of the projects and a failure in others (FARM/SOS, 2008). This study, therefore, contributes in identifying the factors contributing to the success or failure of projects, which employ participative community forest management strategy. More specifically, it sheds light on the complex relationships between the

identified factors and participation in community forest management in the case of Goba and Dello districts of Bale Zone, Oromia Region.

1.2 Statement of the Problem

Approximately hundreds of thousands of people in Bale mountain area and twelve million people, live in this region, are dependent on the ecological zone of the Bale Mountains (Oromia State Forest Enterprise Supervising Agency, 2007). However, there is a high rate of forest degradation and fast depletion of natural resources. For example, 1250 hectares of forest in Dello district were destroyed by fire in 2008 alone (FARM/SOS, 2007).

In 1995 alone 32,000 hectare of forestland was converted to agricultural land in the Oromia region. The current loss (between 2000 and 2010) is estimated to be more than 8.7%. It is further estimated that between 1990 and 2020, the region could lose 27% of its high forest resources from agricultural expansion (WBISSP, 2001 cited by Oromia State Forest Enterprise Supervising Agency, 2007:5).

According to the agency's report, the situation described above for Oromia region holds true for Bale and also the districts under investigation in this study. The report specially applies to Goba district. A study by IRIS Consult P.L.C. shows that about 10% and 65% of forests have been converted to agricultural land in Dello and Goba districts in the years between 1986 and 2006 respectively (FARM/SOS, 2008).

A project called participatory forest management run by FARM Africa and SOS Sahel Ethiopia in collaboration with the Oromia regional government was established in 2006 in the four districts of Bale Zone (Goba, Dello, Nenesebo and Harrana). For similar projects in the world, the major objectives are environmental protection and improving livelihoods. Three years have passed since the programme started, and the outcome in the different districts varies greatly. The project in Dello has been established successfully while it was not successful in Goba (FARM/SOS, 2008). So far, no study has been conducted to investigate as to why the establishment of PFM is relatively slow in Goba and fast in Dello. Furthermore, even though a number of researchers have made investigations in this area scholars argue as to the most important factors determining successful common resource management (Agrawal, 2001;

Poteete and Ostrom, 2003). Thus, this study contributes to the current literature providing a better insight into context specific determinate factors for the establishment of successful PFM programme in the study area.

1.3 Research Question

The following key research question, from which objectives of the study were derived, was designed with the intention of accessing context specific factors for successful establishment of PFM.

What are the determinating factors for the successful establishment of community forest management in Goba and Dello district?

1.4 Research Objectives of the Study

1.4.1 General objective of the study

The general research objective of this study is to explore factors that explain successful establishment of PFM in Goba and Dello district, Ethiopia.

1.4.2 Specific objectives of the study

The specific objectives of the study on *Determinating Factors for Successful Establishment of Participatory Forest Management (PFM)* are:

- To identify and assess the economic factors that determine participation in Participatory Forest Management
- To identify and assess the social factors that determine participation in Participatory Forest Management
- To identify and assess the biophysical factors that determine participation in Participatory Forest Management

1.5 Significance of the Study

The importance of doing such research on *Determinating Factors for Successful Establishment of Participatory Forest Management in Bale Zone* has three major benefits. First, as it has been discussed in the problem statement part, no research has been done so far to assess the prevalent problem arising in the area and hence the findings of this study will have great role in contributing with critical assessment of the topic under discussion. In this regard, this research study is expected to be indispensable *for all stakeholders* that have their own stakes and being engaged in the enhancement of the PFM. Second, this study serves as a good basis for forthcoming researchers who have a strong desire to carryout a research on this or related topics in Bale region or elsewhere. Third, this study is a contribution to the current literature on commons and on how to establish and manage common resources successfully through collective action (PFM in this case). Thus, this research contributes to the current literature on determining factor of household decisions to get involved in PFM by examining context specific factors pertaining to the case under discussion.

1.6 Delimitation or Scope of the Study

The management of common resources through local participation is a very complicated project. A number of factors, which include economic, social, biophysical and demographic factors, determine the success of such a project. This study is delimited to certain variables, namely economic, social and biophysical, that are clearly mentioned in the third chapter. Although participation of local communities is the central element of sustainable participatory forest management, synergy between state and civil society is also important. This requires the cooperation of stakeholders involved in the project and success is determined by the effectiveness of the cooperation between them. This implies investigation of why establishment of PFM was slow in some sites and fast in others deserves a detailed assessment of all the stakeholders involved. However, this thesis has focused on just one major stakeholder, namely the community.

In addition, the research study is delimited to:

- The areas specified, that is, *Goba and Dello district, Bale Zone*
- *Sample size of 80*, considering the time, resources and funding, believed to be representative.
- The method, *triangulation*, which is assumed to be most appropriate by the researcher for the research study.
- *Best available tools*, household questionnaire as well as interview, focus group discussion and onsite inspection, which are assumed to be the most appropriate by the researcher for the research study.

1.7 Limitations of the Study

The study has a comprehensive coverage limitation (i.e. small sample size that is about 80 household's respondents including interviewees and focus group discussion from different sampling units/groups) that could lack complete representation relative to the size of the population in the districts covered under the study. It could have been better to take a sample from all pilot districts but due to time limitations, it was not possible for the researcher to do this.

1.8 Organization of the Thesis

Background of the study, the research problem, objectives, scope and limitation of the study are the main body incorporated in the first chapter just discussed. Brief description of Ethiopia and Bale region are presented in the second chapter. In the third chapter, the works of previous scholars from which the conceptual framework for analysis and hypotheses are derived, were discussed in detail. In the fourth chapter, the research methodology used in this study is presented. In the fifth chapter, findings from the household survey, staffs of the project and Bale forest enterprise, onsite inspections, focus group discussions and secondary sources are presented and analyzed using descriptive, statistical and econometric tools. In the final chapter, a number of issues that warrant further research, conclusion and possible recommendations/ policy implications are presented.

CHAPTER TWO: DESCRIPTION OF THE STUDY AREA

2.1 Ethiopia

With a total area of 1,221 900 km² Ethiopia is the second most populous and third largest, country in Africa. Located in tropics, Ethiopia has a climatic condition that varies with altitude. Altitude ranges from hot and arid region below sea level to the cooler high land area 4620 meter above sea level (UNEP, 2007).

The major economic activity of the country is agriculture. For example, through 1982-1992, agriculture contributed about 45% of the total GDP and forests contributed 5.5 % to the agricultural sector and 2.5% to the GDP (this figure only includes the formal sector of forestry) (Bedru, 2007). In 2009, the contribution of agriculture to GDP was 44%. According to Abebe et al, the contribution of forestry sector to GDP was about 5.5% in the same year (Abebe, H., Million, B., and Andrew, R., 2009). Comparing the two figures (2.5% and 5.5%) there is a remarkable increase in the contribution of forestry sector to GDP of the country.

Ethiopia is characterized by high rate of forest degradation. The major cause of degradation is expansion of agricultural land. The consequences of forest degradation are decrease in productivity of land and decrease household in welfare (FARM/SOS, 2007). This is true at least for two reasons. First, the removal of trees without sufficient reforestation has resulted in drought and this in turn results in reduction of agricultural production as agriculture in Ethiopia highly dependent on rainwater. Second, forest is instrumental to control soil erosion and land degradation.

As mentioned in the above paragraph removal of forest has dual effects: degradation of forest resource itself and decrease in productivity of land and household welfare. To overcome this issue local and government efforts at environmental rehabilitation have started from 1960s

through plantation of trees (FARM/SOS, 2007). An alternative approach, PFM, has also been implemented by many NGOs in collaboration with the Ethiopian government since 1990s.

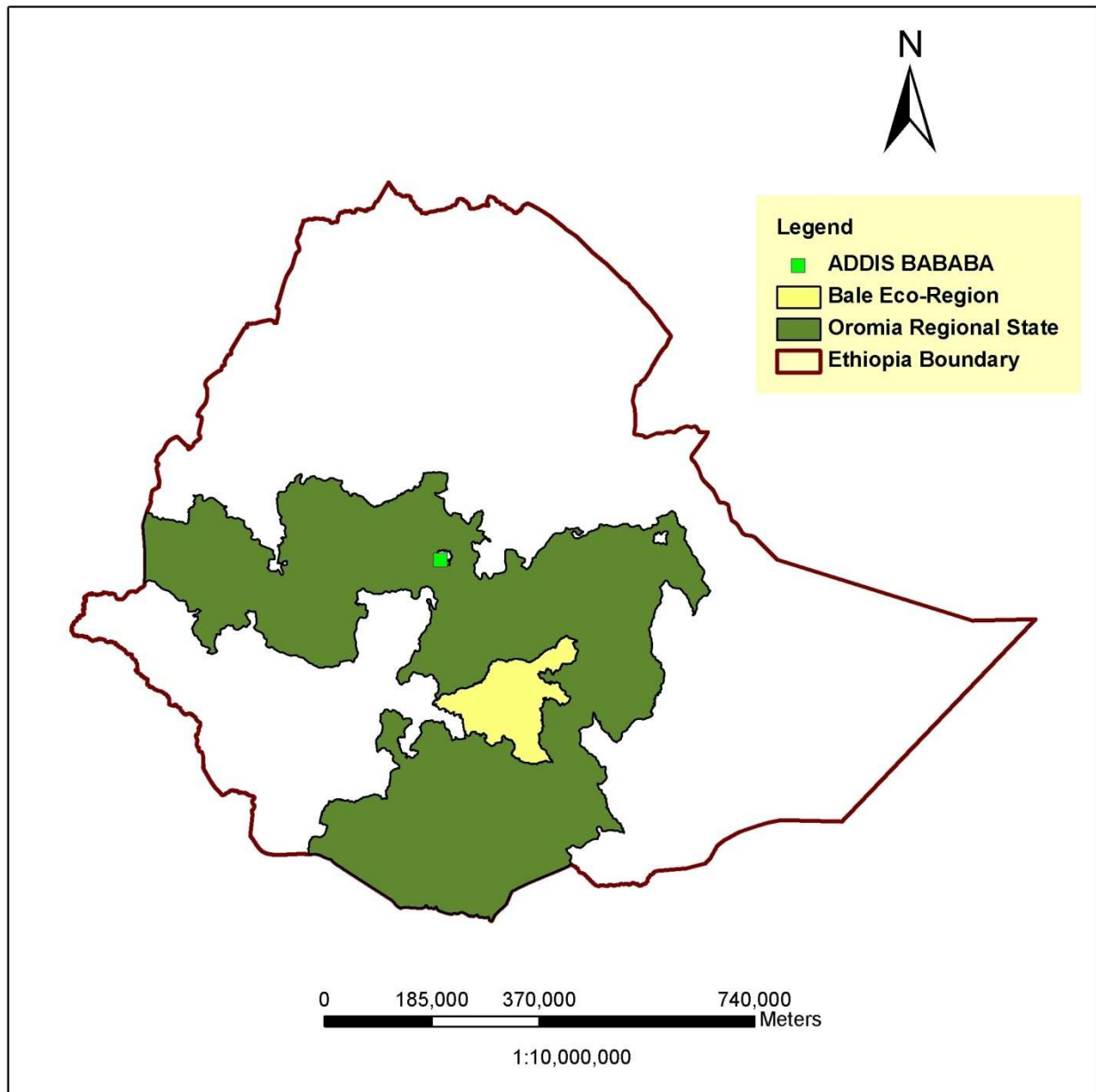


Figure 2.1: Location map of Bale Eco region in Ethiopia

2.2 Bale Region

The total area of Bale eco-region is 22, 176 km² with a total population of 1276 062 in 2001 (ABRDP, 2006). The Bale region is a priority forest area. In the centre is the Bale mountain national park, the largest area of Afro alpine in Africa. The Harrana forest covering the southern part of the mountain is the second largest moist tropical forest in Ethiopia. UNESCO registers Harrana forest as world heritage area. Topographically Bale eco region is a high land area. The elevations of the area ranges from 1500 to 3500 meter above sea level (FARM/SOS, 2007).

Agriculture is the main economic activity of the area and it contributes about 85% to household's economy. Expansion of agricultural land is very high in the area. About 10% and 65% of forest has been converted into agricultural land in Dello and Goba district, respectively in the years between 1986 and 2006. High population growth rate and demand for fuel wood are among the factors aggravating the problem. This is especially true in Goba as the forest in this district is a source of fuel wood for the two big cities in the Bale eco region area. Wild fire is also a common crisis that has endangered the forests of the region. Again, Goba is the most exposed district than Dello experiencing two big fires within the last ten years (in 2000 and 2008). Refer to Annex D to look picture taken about the fire. Mostly, the fires were set by farmers intentionally to expand agricultural land (FARM/SOS, 2008).

Livestock is another very common economic activity and major natural resource management issue in Bale. According to a study conducted by Flinatin et al (2008) household income from livestock products in the region now is very high compared to the Derg regime. Obviously, increase in income from livestock products can result from increase in the number of livestock. The increase in the number of livestock however, has a negative effect on the forest resources of the area, as the source of fodder in the area is mainly forest. Nomadic people in the region are used to moving to the high land areas of Bale mountain national park during dry seasons of the year to get fodder and shade for their livestock.

Over half of the areas in Dello (56%) and Goba (54%) districts were covered by vegetation in the year 2000. To observe this attractive nature of the region please see Annex D. Currently, due to several reasons discussed in the above paragraphs, such as lack of land use management plan,

lack of control of resource use, expansion of agricultural land and degradation of grazing area, negative pressure is growing on natural resource and vegetations of the area (FARM/SOS, 2007).

In response to the above threats, the Oromia Regional Government has invested in conservation and development initiatives in the Bale zone area, including implementing projects with conservation and development agencies. An intervention proposal was developed by the regional governments and attracted the interest of donors and NGOs. This resulted in the establishment of PFM programme in Bale, which is jointly implemented by government (Bale Forest Enterprise), and Non-Governmental Organizations (FARM Africa and SOS Sahel Ethiopia) partnership (FARM/SOS, 2007). The programme's priority area includes Goba, Dello, Harrana and Nenesebo. The programme, which was intended to conserve the unique bio diversity of Bale region, is not established successfully, however. In Dello and Harrana, the establishment process is relatively faster than Goba and Nenesebo. This situation compelled the researcher to carryout this study.

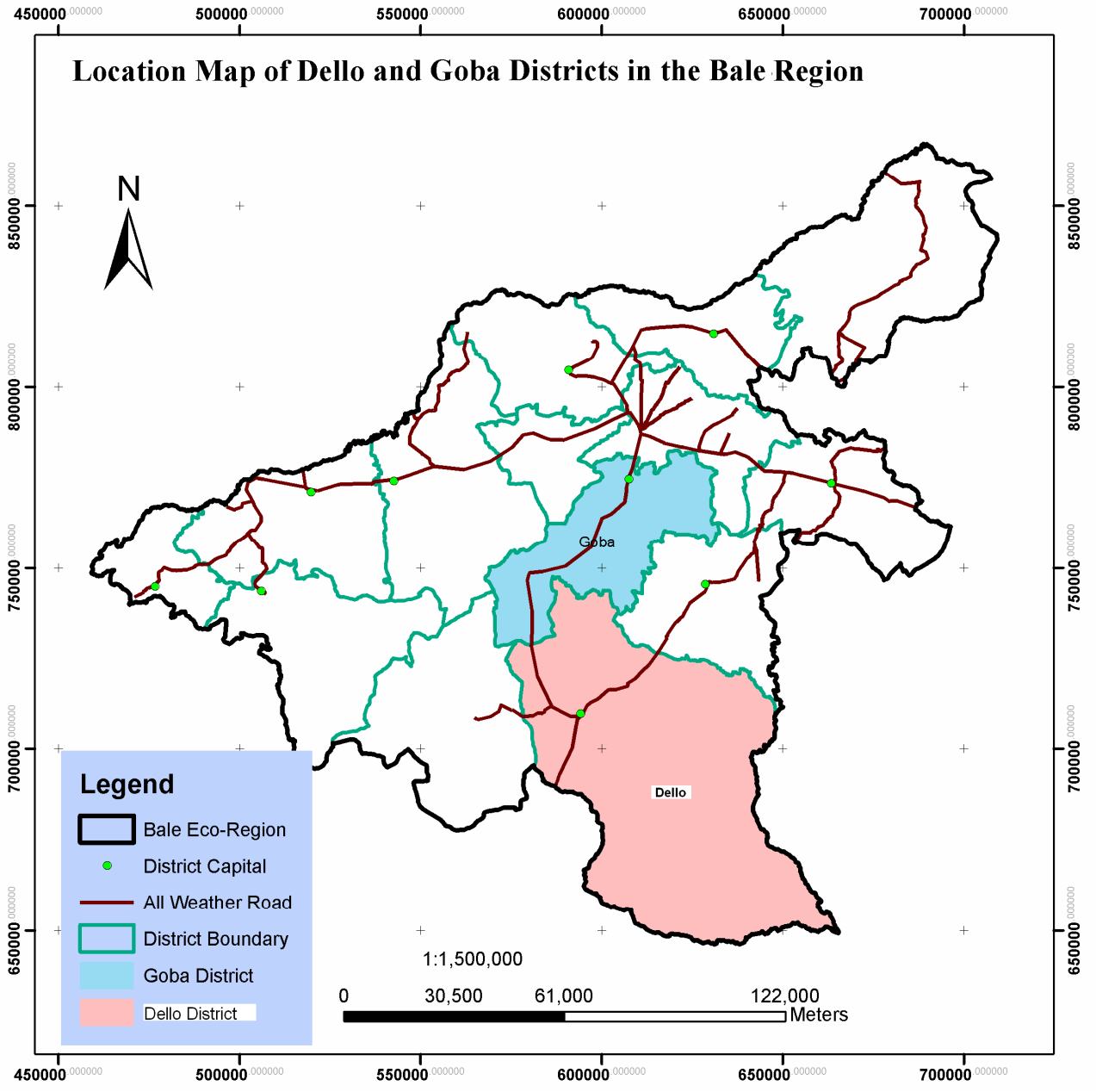


Figure 2.2: Location map of Goba and Dello districts in the Bale region

CHAPTER THREE: LITERATURE REVIEW AND

THEORETICAL FRAMEWORK

3.1 Participatory Forest Management (PFM)

World forests have been degraded by about 40% since agriculture began (10,000 years ago) and three fourth of this loss occurred in the last two centuries (UN, 2005). Currently, only 30% of the Earth is covered by forests (UN, 2005). Moreover, 3% of the Earth's forest was lost between 1990 and 2005 and the rate of degradation is becoming more serious (UN, 2005). The battle against forest degradation is getting tough and challenging as the degradation rate worldwide from 2000 to 2005 was about 7.3 million hectares per year (Schulte et al, 2008). This is the same size of the West African country Sierra Leone.

The increase in population at an alarming rate and poverty has often been cited as major causes for fast forest degradation. Consequently, it was assumed that involving people in and around the forest in forest management activities would reverse or at least stop the decline. It was with this intention that many of the community forest projects were established in the 1970s throughout the world in genera, and Asia in particular (Fisher, Prabhu and McDougall, 2007). Hence, three decades have passed since the introduction of Participatory Forest Management (PFM) with the general objective of controlling forest degradation and achieving conservation of biodiversity on the one hand, and empowering communities to participate and improve their living condition on the other hand (Fisher, Prabhu and McDougall, 2007).

The specific objectives of PFM are different in each country. Protection of national forest degradation and rural poverty alleviation were the main motivation behind leasehold forestry in Nepal and joint forest management in India (Pokharel, 2008). In some other countries, such as Honduras, PFM has been associated with government decentralization programme (Southworth and Tucker, 2001). In Bangladesh, the program has been launched in the 1980s with the

objective of involving local communities in managing forest resources. In Ethiopia PFM was recommended by NGOs to solve the problem of forest degradation (Mustalahti, 2006). The motivation behind PFM programme in Bale region was to conserve the unique biodiversity and ecological functions of the Greater Bale Mountains Eco region, whilst establishing and enhancing sustainable local community livelihoods (FARM/SOS, 2007).

Sustainable forest management is not only a tool to improve livelihoods and conservation of forest resources but also is central to the achievement of many of the Millennium Development Goals (MDGs). Almost all MDGs are related to forests in one way or the other. In Cameroon, for instance, forest and forest products contribute 5–37 per cent to households' cash income. In India, approximately 90 per cent of the population of the state of Manipur depend on forest products as a source of income. On average, natural resources account for 35 per cent of total household incomes in Zimbabwe. Forestry has also played a role in the second Millennium Development Goal, universal primary education, by improving income source for the community and allowing them to send their children to school. The empowerment of women and gender equality can also be assured simply through empowering women to participate and enabling them to generate income. Forests are basis for medicine, many rely on traditional medicine, and this is especially true for the poor who cannot afford to buy modern drugs and do not have access to clinics. Finally, forests play an important role in environmental sustainability (Roe, 2007).

Regardless of the strong relationship between Millennium Development Goals and forests (as described in the above paragraph), little attention has been paid to this sector by the world leaders gathered at Johannesburg to agree on the MDGs in 2000 to bring sustainable development for the world as only one of the 61 indicators deal with this sector (Roe, 2007).

The success of PFM projects in some countries like Nepal and India has resulted into sustainable use of forest resources thereby witnessing the contribution of the sector to Millennium Development Goals. For this, it worth quoting Fisher, Prabhu and McDougall, (2007:3) in full:

The initial focus on involving community in government programmes for reforestation and forest protection has also gradually evolved towards more devolution of decision-making power and more active use of forest resource by the local communities

The initial goal of the program was to supply forest products to local people on a sustainable basis, however, in the course of implementation, the program was found effective in improving the livelihood of local community (Dhakal and Masuda, 2008). Within a period of only three decades, Nepal forest conservation strategy improved greatly. The government handed over 25% of the state forest to the community and almost about 35% of the total population is involved in community forest management. The conservation program, which was initially started to preserve forest resource, contributes about 10 million US dollar to the national economy each year; in which part (1/3) is invested in pro-poor program and 25% is invested in forest development.

Community forestry is contributing to livelihood promotion in many ways. These include fulfilling the basic needs of local communities, investing money in supporting income generation activities of the poor people and providing access to the forestland for additional income or employment (Pokharel, 2008:11).

Currently, Nepal's PFM is in its second stage of development a stage where issue of good governance, sustainable forest use and its contribution to livelihood is to be achieved concurrently (Pokharel, 2008). Not all these success stories of Nepal, however, are without challenges as stated by (Kanel, et al, 2005). The program suffered from a number of challenges including: value addition problem to forest products through enterprise development, multiple forest management regimes, assuring better coverage of the program, use of the community forests for poverty reduction and income generation and better fund utilization for the users group. Fisher, Prabhu and McDougall, (2007) mention the socio cultural hierarchy, the entrenched bureaucratic culture of multilateral government agency and limited human and financial resources as a major challenges of Nepal's PFM programme. To alleviate these problems the following actions were taken. First, the community forestry was redefined for livelihood support. Second, income of the community forestry was used for poverty reduction. Third, more Community Forest access were given to the poor as sub-user groups. Finally, allowing Community Forest User Groups to establish enterprise in the vicinity and increasing the involvement of local government in Community Forest (Kanel, et al, 2005). Experience from Nepal suggests the reconfiguration of forest policies and operational rules as a prerequisite for sustainable forest management and livelihood promotion. The legal framework also needs to

develop over time to meet the specific local needs. Nepal's experience signifies the absence of universally applicable forestry policy, which works well for all countries; the best policy is the one that fits to the existing condition. The creation of a comprehensive program in the policy framework, the expansion of civil society and democratic movement to rural areas and support provided by international agencies were the major opportunities of Nepal PFM programmes. The increase in market demand for non-timber forest products further strengthened the community association (Fisher, Prabhu and McDougall, 2007).

3.2 Common Resource Management

Common resource management requires collective action, which in turn requires member cooperation to manage their resource effectively (Ostrom, 1990). The effort of commons in collective action is directed towards the achievements of common goals. Participants in common resource management face the dilemma of how to increase their own share of profit and at the same time contribute their best to the management of forest resource to stop further degradation through collective action (Wade, 1987). This raises a question on how to alleviate the problem of common good when managed by collective action.

Wade (1987) and (Ostrom, 1990) recommended that, resource users need to develop a set of coordinated strategies on how to change the overexploitation activities in managing common resource and resolve their common dilemma. The coordinated strategy involves formulation of rules of restrained access to common pool resource and inspection of that rule (Wade, 1987). Developing a strategy to resolve the common good dilemma creates a "public good" from which every one may get a benefit regardless of her/his contribution to the management. This in turn encourages individuals to free ride in the management of commons good. Alternatively, the way out from the first order dilemma resulted in second order dilemma (free rider problem) also known as "who guards the guards" paradox (Van Vugt, 2007).

All the dominant models of theory of collective action were practically not viable to solve the problem of common pool resource (Wade, 1987; Ostrom, 2007).

The three dominant models — the tragedy of the commons, the prisoner's dilemma, and the logic of collective action — are all inadequate, she says, for they are based on the free-rider problem where individuals, rational, resource users act against the best interest of the users collectively(Ostrom, 1998:1).

Recent literature has explored a number of social and behavioural factors to resolve the second order dilemma (Wade, 1987; Agrawal, 2001; Agrawal, 2003; Gibson, Williams and Ostrom, 2005). The solution for second order dilemma mainly deals with "how a group of principals who are in an interdependent situation can organize and govern themselves to obtain continuing joint benefits when all face temptations to free-ride, shirk, or otherwise act opportunistically" (Ostrom,1998:1).

The social and behavioural factors include norms, social sanction, trust, and so on. On the other hand, analysis of individual incentives to involve and contribute to the management of common resources is the most important explanation of the effectiveness of common resource management. Deep in these incentives is the costs incurred and benefits generated by individuals through involvement in common resource management. Put it simply, economic factors are what mostly determine decisions of individuals. This in turn is influenced by different factors: nature of the resource, community characteristics and external factors (Wade, 1987; Agrawal, 2001; Agrawal, 2006).

3.3 Determining Factors of Common Resource Management

Huge amount of funds have been exerted to make the collective action towards management of common resources fruitful by both government and NGOs. On the other hand, the devolution of common resource management is yet to generate tangible benefits, except in few countries like Nepal. Thus, there is a growing concern about the success and sustainability of common resource management approach. Many researchers have conducted researches about the major factors that determine the effectiveness of community based resource management. Almost all of them agree on one important factor, institutions, for the success of collective action in managing a common resource (Wade, 1987; Agrawal, 2001; Agrawal, 2006; Van Vugt; 2007). This does not mean that well-established institutions alone lead to success of common resource management

approach. Researchers have further explored the determinants of successful collective action and come up with different factors (Wade, 1987; Agrawal, 2001; Gibson, Williams and Ostrom, 2005).

Agrawal (2001) analysed the findings of the three well-known scholars of commons: Ostrom, Wade, Philippe and Plateau to produce a comprehensive theoretical generalization in diagnosing the major determining factors of effective and sustainable common resource management. He also added some factors from his previous findings. In general, the factors described by Agrawal are classified into four major categories: biophysical characteristics of the resource, characteristics of the user group, institutional arrangements and external factors. The list of all factors affecting the success of common resource management ranges from 30-40. The list by Agrawal is presented in Table 3.1 below.

Table3.1: Factors that affect the success of collective common resource management

| |
|--|
| 1. Resource system characteristics |
| • size of the resource |
| • clearly define boundaries |
| • label of mobility/ movement of the community from place to place |
| • possibility of storage of benefit from resource |
| • predictability |
| 2. User group community characteristics |
| • group size |
| • clearly defined boundaries |
| • prevalence of shared norms |
| • prevalence of past successful experience/ social capital |
| • leadership/ local hierarchy |
| • heterogeneity in endowments |
| • heterogeneity in identity and interests |
| • interdependence among group members |
| 1 and 2 relationship between resource system characteristics and group characteristics |
| • Overlap between user group residential location and resource location |
| • Level of dependence by group member on resource system |
| • Fairness in allocation of benefits from common resources |
| • Nature of changes in level of users demand |
| 3. Institutional arrangements |
| • local vs. external devised and management rules |
| • degree to which rules are simple and easy to understand |
| • easy in enforcement and monitoring of rules |
| • availability of low cost adjudication |
| • accountability of monitors and other officials to user |
| 4. External environment |
| • Cost of exclusion technology |
| • time for adaptation of new technology related to commons |
| • level of articulation with external markets |
| • nature of changes in articulation with external markets |
| • central government undermining of local authority |
| • external sanctioning institutions |
| • levels of external aid to compensate local user for conservation activities |

Source: Agrawal (2001)

In his analysis, Agrawal also tried to identify limitations of previous investigations (Agrawal, 2001; Agrawal, 2003). First, factors like demographic characteristics of respondents were not included in the analysis of prior researchers. Knowledge about the magnitude and relative importance of those variables are also very poor due to absence of statistical analysis particularly those based on data from local level (Argawal, 2001; Argawal, 2003; Argawal, 2006). Furthermore, there are other contextual factors, which are not simple to understand, and make theoretical generalization more complex. Thus, in this study, the researcher has contributes to the current literature on determinant of household decisions to involve in PFM by examining context specific factors.

Only context specific factors that best explain the difference in establishment of PFM between Goba and Dello are discussed due to limited scope of this study. These are: total income, total forest income, income from sales of firewood, income from coffee, livestock income, perception/understanding about Community Based Organization, household size, *hamlet* (a place where the households reside), distance from forest and distance from market. Other factors, such as, understanding about the aim of livelihood diversification programme, households understanding about the benefits and costs of PFM, the role of traditional forest management system, performance of the staff, expansion of agricultural land and market demand of firewood were also expected to have an effect on decision of the households whether or not to participate.

3.3.1 Economic factors

Annual gross income of the respondents

The effect of community annual income on participation is mixed. Annual income is a significant factor for a community to accept and participate in community resource management (Shahbaz and Ali 2000). On the other hand, a survey conducted by Kugonza et al (2009) has suggested the absence of a relationship between participation in common resource management and annual income of respondents. An investigation done by Chhetri (2005) in Nepal also does not show any significant relationship between community participation and annual income.

Economic value of forest/ income from forest

Many studies have proven that economic value of forests is one of the major determining factors on individual decisions whether to participate or not in the management of a common resource. Behera and Engel (2006), in India, revealed the significance of economic value of forests to successful PFM programme. A person who generates much from forests or whose livelihood greatly depends on forests has a high probability to get involved in PFM. Gibson also suggested that the likelihood to participate in PFM increases significantly as the economic benefits one could generate from PFM increases (Gibson cited by Gebremdhin, 2008). A study conducted in the South-eastern part of Ethiopia by Gebremdhin also found significant relationship between forest income and participation (Gebremdhin, 2008). Faham et al (2008) in their study in Iran further stated that, economic motivation and forest dependence are positively and significantly correlate with forest dwellers' participation in development of forest areas.

All the above findings are inline with well-known scholars of commons, such as Ostrom, Wade, Philippe and Plateau (Ostrom et al cited by Agrawal, 2001). Argawal and Chhatre (2006) in their study in the northern part of India suggested the following. When utility, or the over-all subsistent benefit, from a common resource increases, resource users make greater efforts to protect the forest. High levels of dependence encourage greater participation in forest governance (Lise, 2000). Moreover, Wade (1987:10) also found the same result from his study in Eastern India, "the better their knowledge about sustainable yields the greater the chance of success." Contrary to the above findings, a research conducted by Kugonza et al (2009) in North-western part of Uganda recommended that respondent's dependence on forest resources have no significant impact on willingness to participate in community based forest management.

Firewood sales

Although commercial logging (ex. firewood sales) is one of the major causes of forest degradation the issue of firewood is under researched in the common resource management literature (Poffenberger, Shiva and Correa cited by Sarker and Das, 2004). Obviously, participation in PFM restricts their rights to sell firewood hence the community may not involve in PFM (Correa cited by Sarker and Das, 2004).

Livestock income

Livestock assets of households were considered by many scholars as a determinant factor to involve in protection of forest resources. A quantitative study conducted in Nepal recommended that household with large number of livestock has a high probability to participate in community forest management than their respective counterparts (Chhetri, 2005). This is very true for pastoralist communities as they need forests and grass for fodder to feed their cattle. This finding is inline with the finding of Agrawal and Chhatre. The study by Agrawal and Chhatre in three Indian states, who used an econometric model and suggest that household's livestock assets are strongly and positively related with the involvement in protection and development of forest resources (Agrawal and Chhatre, 2006).

3.3.2 Social factors

Understanding /Perception of the community

A qualitative study in North-western Uganda, based on participatory rural appraisal method by Kugonza et al (2009) suggests that the attitude of people towards community forest management is influenced by education. They further recommend that the attitude of the community towards common resources can be changed by educating the community about common resource management. Faham et al (2008) in their study in Iran discovered strong positive and significant correlation between extension education course and participation. This complements with the findings of Varamini and Shariati (Varamini and Shariati cited by Faham et al 2008). A study by Matta and Alavalapati (2005), based on an empirical analysis of joint forest management in India, explores variations in the perceptions of collective action by community members and factors which affect community perception. The investigation underlined the need for a shared understanding of collective action among community members for successful and sustainable joint forest management. The author suggests careful consideration of the level of understanding before and during implementation of community based natural resource management. Likewise, Salam et al (2007: 5) in their research in Bangladesh came up with similar findings, "training of participants on different aspects of participatory forestry is positively related with farmer's sustained participation."

Household size

Scholars of commons agree on the significant positive relationship between household size and community participation in common forest management (Agrawal, 2005; Chhetri, 2005; Faham et al, 2008). This is consistent with the works of Tiffen, Mortimore and Gichuki on soil erosion in Kenya. Large families adopt labour-intensive technology and thereby contributing a lot to the improvement of soil erosion (Tiffen Mortimore and Gichuki, 1994).

3.3.3 Biophysical factors

Hamlets/ area of forest

In explaining the role of area (*hamlets* in this context), scholars of common link it to elevation which in turn significantly determines quality of forest and/or the type of non- timber forest products found in the area (Agrawal , 2006). Chhetri in his study in Nepal found a significant association of participation in resource utilization with forest condition, though the relationship was not strong (Chhetri, 2005).

Distance from forest and distance from market

The relationship between distance from forest and participation is not clear. “The greater the overlap between the location of common pool resources and residence of the users the greater the chance of success (Wade, 1987:10).” Chhetri (2005) and Kugonza et al (2009) found a negative relationship between distance from forest and community involvement in forest protection, resource utilization and decision-making.

Scholars of common have mixed thought about the effect of distance from market on participation. Writers, who are in a significant literature, on the effects of roads and markets found a positive relationship between distance from market and conservation of forest. (Angelsen & Kaimowitz, 1999; Southworth & Tucker, 2001, cited by Argawal and Chhatre, 2006). But, Agrawal and Chhatre questioned the findings of these researchers:

We account for the observed relationship by suggesting that distance from roads can also be a proxy for distance from government offices, and that official presence acts as a disincentive to deforestation. Thus, in contexts where state officials are effectively present in local contexts, distance from roads or markets is not an efficient measure of economic pressures because its effects are confounded by those of government influence (Agrawal and Chhatre, 2006: 10).

Recent findings on the impact of distance from market in forest protections support the view of Agrawal, (Chhetri, 2005; Agrawal and Yadama, 1997; Alvarez and Naughton-Treves, 2003; Nagendra, Southworth, and Tucker, 2003 cited by Argawal, 2006).

3.4 Framework for Analysis: Creating a State Civil-Society Synergy

The literature of scholars working on commons put forward arguments as to the best approach in managing common resources effectively. Some group of writers prefer the centralized management system. The other group proposes the decentralized system as an alternative approach. The decentralized management approach also called the PFM in the context of this study involves a number of stakeholders. The outcome from this programme is also highly dependent on the cooperation of the stakeholders involved. The main stakeholders of PFM in Bale include Oromia regional government (Bale forest enterprise), FARM/SOS, Donors (embassy of Norway, Netherlands and the Irish Republic), the local community and different government organs and NGOs. FARM/SOS is playing facilitator role whereas implementation is the role of government organs (mainly Bale forest enterprise). The main role of the community includes conservation and utilization of the resources. On the other hand, PFM implies the need of clear and recognized access rights to this resources as well as multi stakeholder's agreement on the objective of forest management (FARM/SOS, 2008). In this study, the research tried to dig out the condition under which communities are willing to participate in PFM.

Local participation in development activity is suggested as a way to increase productivity by scholars of commons (Wade, 1987; Evans, 1996). Evans (1996: 1123) explained the synergy between state and civil society in the following way. "When public agents and citizens have

sufficiently different but equally necessary kinds of inputs, they can produce more efficiently by combining their efforts than either producing every thing privately or every thing publically”.

The creation of synergy can be assured through involving local community in development. So far, there is no universally accepted definition for the term involvement/participation. The United Nations defines participation as a means of mass sharing benefits, mass contribution to development and mass involvement in decision-making process to development (UN, 1975). For the purpose of this study, participation is operationalized to mean joining the Community Based Organization or being a member of PFM.

Empowering Civil Society for Participatory Forest Management in East Africa (2009: 5) defines participatory forest management as:

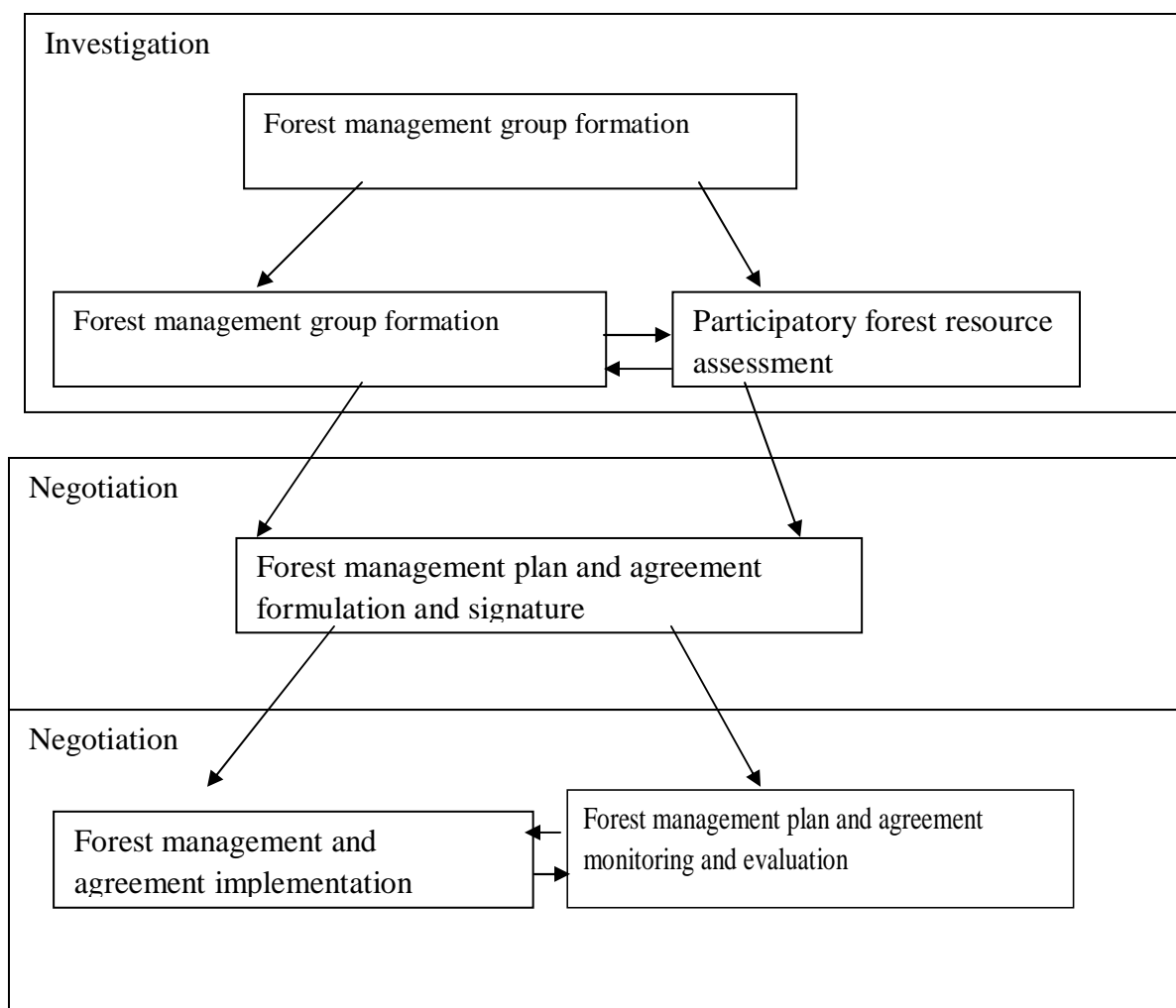
Participatory forest management is a term understood to refer to all forest management approaches where all stakeholders actively take part in forest management to attain sustainable forest management. Participatory Forest Management is about working together (collective action). It calls for respecting each other as equal partners or stakeholders doing work for the same purpose.

Participatory forest management includes many forms of partnership. The first one is collaborative forest management in which the community cooperate with the government. The second one is joint forest management in which the community lead agency and the community take over the duty of conservation of forest (Lawrence and Green, 2008). FARM/SOS(2008:34) defines participatory forest management as “a system in which the communities (forest users and managers) and government services (forest department) work together to define rights of forest resource use, identify and develop forest resource responsibilities, and agree on how forest benefits will be shared.” For the purpose of this study, PFM is operationalized to mean the definition given by FARM/SOS.

The main objectives of the programme (PFM in Bale) are sustainable management of resource and improving the livelihoods of the community. To attain these objectives the PFM approach passes through three stages (See figure below).

The first is investigation stage. There are three main activities in this stage: set up of forest management group, participatory assessment of forest resource and finally the assessment of forest based livelihood potentials. Establishment of forest management group takes a longer time in Dello compared to Goba even though; there is some variation within Dello itself. One major reason for this is the difference in perception or understanding between communities. Put it simply, the activities in set up of forest management group include teaching the communities about the Community Based Organization and its major benefits. Performing this basic and first activity well has an obvious impact on decision of the participants.

The second stage is negotiation. The community forest management group and the government (the Bale forest enterprise in this case) reached an agreement on the forest management planning. The last stage is implementation, where the forest management plan is put into operation (Zelalem et al, 2007). The schematic representation of the three main stages is presented below.



Source: Zelalem et al, 2007

Figure 3.1: Key elements in refined PFM approach

One way through which the programme is intended to improve the livelihood of the society (attaining one of its objectives) is by encouraging forest based livelihood diversification programme (See Figure above). On the other hand, there is a great variation in the quality of the forest resources in the area. Dello forests are very rich in their natural stock: wild coffee and camp honey, while non of these products are available in Goba forests. The limited availability of non- timber forest products can obviously have an effect on the amount of income generated from forests. And will have an effect on the decision of households or community to participate in PFM.

A number of motivating factors impact on households' decision to participate in community forestry programmes. The conceptual framework in this study assumes annual income, forest income, firewood sales, income from coffee, income from livestock, perception/understanding of the community, household size, *hamlet*, distance from forest, distance from market and age as determinant factors of household decision to participate in PFM. Other factors, such as, understanding about the aim of livelihood diversification programme, households understanding about the benefits and costs of PFM, financial support, the role of traditional forest management system, performance of the staff, expansion of agricultural land and market demand of firewood were also expected to have an effect on decision of the households whether or not to participate.

Perception of the community is operationalized as respondent's level of understanding about the major activities in Community Based Organization (CBO) formation. Community level Forest Management Groups continue to be the focus of natural resource management CBO development. The set up of natural resource management CBOs is a key activity of the first or investigation stage (See the above figure). The authority to establish CBO is given to the community. "The community should hold their own in-depth discussions and decide upon the appropriate CBOs that they want to establish. As a result, both Cooperatives and Associations seem to be the preferred options amongst the communities." (FARM/SOS, 2008:26). To formulate this organization FARM/ SOS provided training about PFM to the community then the community elect a representative to formulate rule and regulation on how to administer the forest. Later on this document is presented to the society so that the society reflects on it. Finally based on this an agreement will be made between government body and the community. Thus Community Based Organization is an organization which have legal identity (give the community legal authority over forest resource and the responsibility to protect the forests). To measure understanding of respondents, four important questions related to major activities in Community Based Organization formation were selected and corrected out of eight.

Finally, the schematic representation of theoretical framework for analysis is presented below.

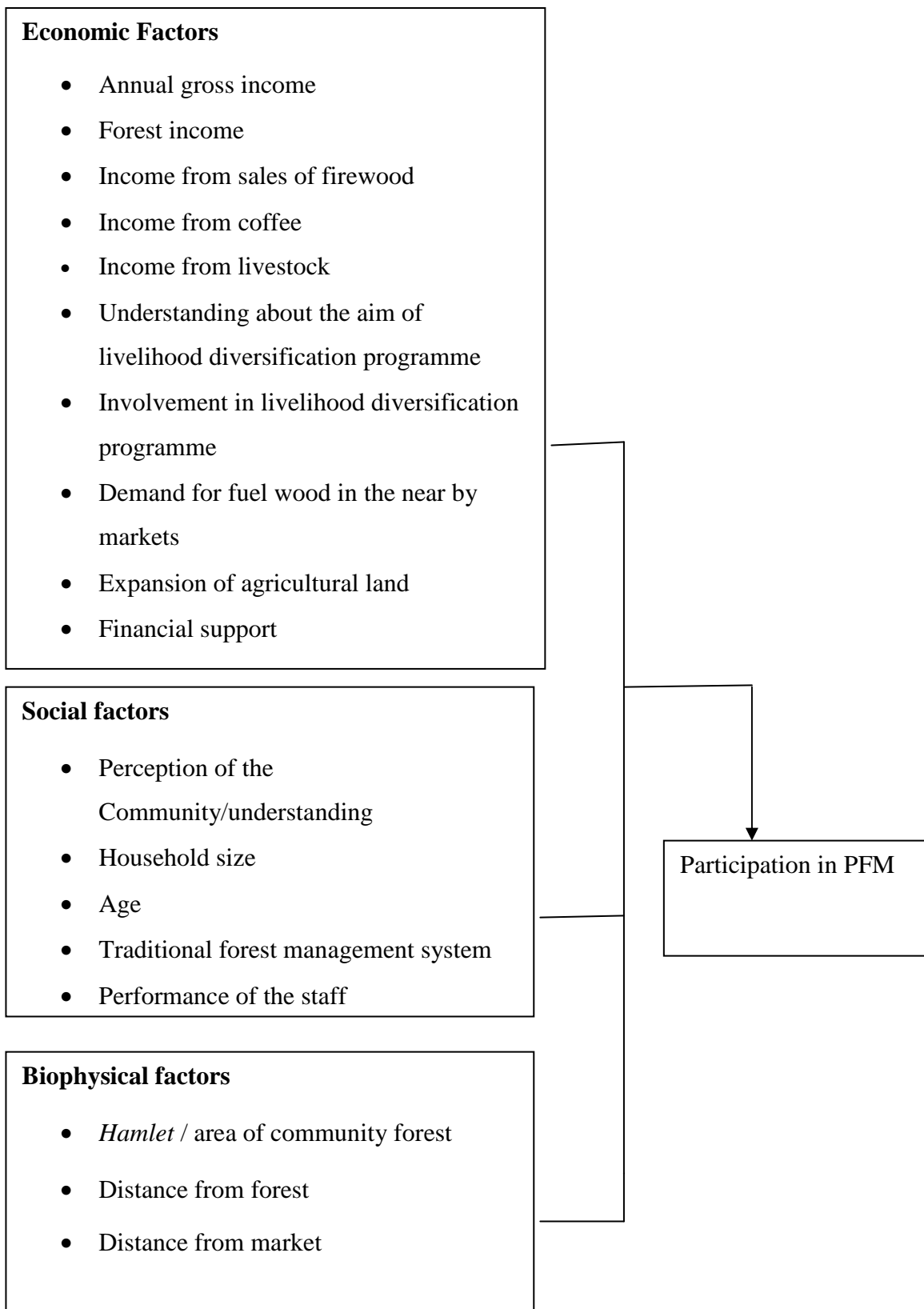


Figure3.2: Framework for Analysis

3.5 Description of Variables and Respective Hypothesis

Dependent variable

Participation is the dependent variable of this study. Participation is operationalized as the involvement of a community in PFM. It refers to being a member of a Community Based Organization (CBO). Accordingly, the variable is coded as follows

- Household was coded 0 if they were not member of the community forest group
- Household was coded 1 if they were member of the community forest group

Independent variables

The independent variables were classified into economic, social and biophysical variables. The description of variables used in this study is presented below with their respective hypotheses.

Annual gross income

The main sources of income for the Fasil respondents were production of crops and income from livestock. Non-timber forest products (NTFP) have minor contribution. Dello community was relatively wealthier than Goba community was. The main sources of income for this community include crop production, livestock and NTFP (coffee and honey). To run the regression, total annual income of the respondents was computed in birr (Ethiopian currency). This value was taken as it is to perform the regression analysis. The richest segments of the community have more time to participate in community meetings and more information about PFM. Thus, one hypothesis tested was people with lesser income are less likely to participate in PFM.

Livelihood options in the forest / economic value of forest

As a rational being, community has reason to preserve forest. The economic value of forest highly determines household decision to involve in community forestry programme. The economic value of forest was measured as a proportion of forest income from total income. The main forest related household activities were firewood sales, coffee, and honey. Based on this fact forest income was expected to have a positive impact on household decision to participate.

Firewood sales

Income from firewood was measured using Ethiopian currency. Demand for firewood in the nearby markets highly influences community decision whether or not to sell firewood.

The use of forest resources in Goba district is regulated by open access. The resources are highly exploited due to the high market demand for firewood in the nearby markets. This is mainly because the district is very close to the two big cities, Robe the capital city and Goba the second largest city in Bale. Things are different in Dello as the demand for firewood is minimal. On the other hand, as sale of firewood is obviously an illegal activity, there will be a restriction on the amount of sales if they joined PFM. In addition, this was boldly stated as a rule in Community Based Organizations agreement. Consequently, knowing this, the community in Goba has a fear; if they join PFM, their use rights of the resource may be restricted. Thus, one hypothesis tested was whether sales of fuel wood have an effect on participation.

Income from coffee

Community has rights to collect benefits from forest coffee if and only if they have participated in PFM. Moreover, prior to the arrival of the project, the forest resources in Dello were planned to be administered by Bale Mountain National Park. Then, the arrival of the project was good news for the Dello community who were about to give their forest resources to a government body (Bale Mountain National Park) had it not been for PFM. Transferring ownership rights to Bale Mountain National Park will definitely result in big economic crisis, especial for those who have coffee in the forest and generate a huge amount of income every year. Thus, it was hypothesized that respondents who have coffee in the forest are highly likely to participate in PFM.

Income from livestock

Households' livestock resource was measured by annual income from livestock. Annual income from livestock is calculated in Ethiopian currency (birr). Households with more livestock are more inclined to use community forests for fodder and grass. Thus, they are more inclined to

participate in community forest management and it was expected that income from livestock have a significant positive relationship with participation.

Perception/understanding of the community

Perception of the community was measured by the level of understanding the community has about the major activities in formation of Community Based Organization. To measure respondents understanding about Community Based Organization, the researcher selected four important questions from the household questionnaire and corrected them out of eight. This variable was changed into categorical variable; some understanding (if they scored greater than two) and no understanding (if they scored two and less than two). Then a dummy variable was created and coded as zero if the respondents have no understanding and 1 if they have some understanding to run the logistic regression.

FARM/SOS thinks the perception and attitude of the community towards PFM has great value. Thus, they tried to change the community's attitude and perception through education and awareness creation. The effects of attitude and perception of the community on establishment of PFM is not clear. Thus, one hypothesis tested was whether such variable has actual effect on the up take of community based forest management project.

Household size

Large families can improve forest condition by increasing aggregate household contributions to conservation and support to institutions that facilitate conservation. Thus, a significant positive relationship was expected between participation and household size.

Hamlet

Scholars of commons classify areas as districts based on the elevation (or altitude) of the land. This is because difference in altitude between two areas brings difference in forest quality between such two areas. Coming to this study, there is great variation between Dello and Goba with regard to quality of forest. Differently stated, the quality of forest in Wabero is better (in terms of providing livelihood support) than that of Fasil. On the other hand, some segments of

community in Wabero are new and not considered by the project as a target group. Thus, it is worth to classify the second village into sub-villages: Befit and Hadha. This is because being in Wabero is not the only determinant as it is easy to observe great variation in accepting PFM between Befit and Hadha given the fact that they live in the same place. As described in section 4.4 there was no difference within Fasil hence no need to classify this village into sub-villages (*hamlets* in the context of this study). Finally, the observation was classified into three *hamlets*: Fasil, Befit and Hadha and coded as:

- 0 if the respondents were from Fasil
- 1 if the respondents were from Hadha
- if the respondents were from Befit

As explained above *hamlets* are an important variable for this study because they influence a host of other variables such as forest quality. In general, Wabero forest has high stock of natural resource while Fasil forest is relatively poor in its quality. On the other hand, there is a great difference within Wabero itself. Almost all of the Befit community are new and do not have coffee or beehives in the forest. Hadha community are native to the area and have coffee and beehives in the forest. For same or different reason, *hamlet* has an effect on household decision to participate in PFM. Hence, living in Fasil, Hadha, or Befit by itself was expected to have a relationship with participation.

Distance from forest

Distance from forest was measured by the time spent to reach the forest. PFM involves both protection and utilization of forest resource. For those who are far away from the forest, it may be difficult to equally participate with those who are inside the forest in forest protection; hence, respondents who travel for three hours to reach the forest may decide not to participate. Thus, it was expected that respondents close to the forest would be more interested to participate in PFM.

Distance from market

Distance from market was measured by the walking time from the nearby markets. Respondents who are very close to the market are expected to join PFM at the earliest. This is because they can easily sell the forest products and support their livelihood.

Age

Age in this study refers to the age of respondent at the time of interview. People feel responsibility as their age increase. Thus, a positive relationship between participation and age was expected.

Table3.2: Summary of explanatory variables and hypotheses

| Variables | Specification | Characteristic of variable | Expected Effects on participation |
|---|---|----------------------------|-----------------------------------|
| Annual gross income | Annual household income in birr from all activity | Continuous | + |
| Income from forest | Proportion of forest income to total income | Continuous | + |
| Firewood sales | Annual income in birr from sells of firewood | Continuous | ? |
| Distance from forest | Time taken to reach the forest in minutes | Continuous | + |
| Distance from market | Time taken to reach the nearby markets in minutes | Continuous | + |
| Hamlet | 0 if they live in Fasil 1 if they live in Hadha 2 if they live in Befit | Continuous | + |
| Household size | Number of people living in the household and/or economically dependent | Continuous | + |
| Understanding about major activities in CBO formation | 0 if no understanding 1 if some understanding | Categorical | ? |
| Understanding aim of livelihood diversification | 0 if have understanding 1 if no understanding | Categorical | ? |
| Age | Years | Continuous | |

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Data Type and Source

As this research explains the relationship between participation and the different explanatory variables, it is explanatory type of study. Both primary and secondary sources were used to collect the data. Semi structured household questionnaire, onsite inspection, interview with the project and Bale forest enterprise staff, and focus group discussion were used to collect data about social, economic and biophysical characteristics of the sampled village households. Secondary data was collected from documents such as journal articles, annual report and performance evaluation report of Farm/SOS and related resources. Thus, both type of data, primary and secondary, were collected from the different data sources.

4.2 Research Strategy

A combination of approaches, qualitative and quantitative, was employed. The quantitative approach was used to analyse data collected from households using semi-structured questionnaire. The qualitative approach was employed to analyse data collected from households, the project and Bale forest enterprise staff through onsite inspection, household questionnaire, interview, focus group discussion and qualitative analysis of documents.

4.3 Research Design

The research design that was used in this study is a cross-sectional design. Cross sectional design studies the relationship between variables at a point in time. In this research, data related to social, economic and biophysical factors for the year 2009 were collected and analysed.

4.4 Sampling Procedure and Sample Size Determination

There are about 14 districts in the Bale region. Currently, the PFM project run by FARM/SOS in collaboration with the Bale forest enterprise is implementing its activities in four pilot districts: Goba, Dello Nenesebo and Harrana. The establishment process in the pilot districts has turned out to be a success in some (Dello and Harrana) and a failure in others (Goba and Nenesebo).

Multi stage sampling procedure was followed to select the sample respondents. First, out of the four pilot districts two were selected purposively based on performance record of the project so far. Accordingly, Dello (to represent success) and Goba (to represent failure) were selected as sample districts. Specifically there are four rationales for choosing to focus on these districts. First and most important of all, there is a big gap between the two districts in adopting Participatory Forest Management (PFM). Thus, it is interesting to study the factors behind the success and failure of the projects. Secondly, there are no places (hotels) to stay during data collection in the other districts (Nenesebo and Harrana). This is especially true for Harrana as there is no single hotel in the capital city of the district. Considering this challenge in Nenesebo and Harrana, the researcher decided to take Goba and Dello as a sample districts. Thirdly, majority of the local people in these districts depend on forest to make livelihoods. Finally, the degradation rate is high in the districts especially in Goba.

In each district, there are two pilot villages where PFM implementation is operational. Out of these pilot villages in the sampled districts, two villages (one from each district) were selected purposely. Fasil was the only village in Goba where a Community Based Organization was established although the transfer of ownership rights over forest resources from state to the community has not been made. In the other village (Ititu-Sura), the establishment of forest management groups was on the process of being set up (they did not get legal identity from the government). Hence, Fasil was selected as a sample with the assumption that respondents have a better understanding about PFM than in the other village. From the two pilot villages in Dello, Wabero and Chiri, Wabero was selected. According to the information collected from the staff of the project, there was no difference between the two villages, in adopting PFM. The reason why the researcher selected Wabero was that an investigation (on carbon trading) was going on by

another researcher in Chiri. Thus, the researcher anticipated respondents get hesitant to answer the questionnaire and thereby compromise the validity and reliability of the data collected.

There was great variation in adopting PFM within Wabero community. Sub-villages (a group of community called Birki's in the local language) who have coffee inside the forest participated well while sub-villages who do not have coffee in the forests had not participated. To make the sample more representative Befit (from those who do not have coffee in the forest) and Hadha (from those who has coffee) were selected purposely. There was no difference within Fasil with regard to participation. Hence, the researcher opted to make the comparison between Befit, Fasil, and Hadha while analysing the data. The three unit of comparison (Hadha, Befit and Fasil) is also named as *hamlet* hereafter. This is because, however, the feedback the researcher had about the outcome of the projects from FARM/SOS indicated success in Dello (Wabero) and failure in Goba (Fasil) it is in contrary to what is at the ground. Later on (during data collection) the researcher came to learn the great variation in adopting PFM within Wabero (as explained above). Finally, even though Fasil is an independent village and comparing it with sub-village is not apparent the researcher assumed this to be logical for the following reasons:

- First and most importantly, the organizational structure of FARM/SOS is structured at district level not at village level. This is to mean that as far as the village is found in Goba district, it is under the administration of one central office placed at Goba. The same holds for Dello. Hence, classifying Wabero into sub-villages and comparing such sub-village with Fasil is not a problem as far as administrative units are concerned. This is because Fasil does not get any privileges (different from the treatments given to Befit and Hadha) in the PFM programme implemented by FARM/SOS for being a separate administrative unit under government structure.
- Second, the total population in Fasil is very small compared to Wabero (Befit and Hadha). Put it simply, even though Fasil is an independent administrative unit under government structure the total population of the village is not greater than the sub-villages in Wabero (Befit and Hadha independently).
- Third, Fasil population is homogeneous in their characteristic (in adopting PFM i.e. there was no other factors which make some sub-village unique from the other in terms of

adopting PFM like that of Wabero) hence no reason to classify this village into sub-villages.

- Lastly, in literature of commons *hamlet* (commonly named district in the literature on commons) is frequently used as a determinant factor of participation in forest resource management. Agrawal and Chhatre (2006) in their study in India use *hamlet* as an indicator of quality of forest (one of the determinate factors of PFM) without referring to administrative unit.

Finally, thirty households from Fasil and fifty households from Wabero (Hadha, 31 and Befit, 19) were selected randomly, yielding a total sample of eighty.

A pre-pilot questionnaire was developed and discussed with the project staff. An adjustment was made to the questionnaire as per the comments of the staff. A pilot test of questionnaire was made in both survey sites. Amendments were made to exclude ambiguous and irrelevant questions accordingly.

Questionnaires were prepared in English and translated into local languages (Afan Oromo and Amharic). Respondents were asked which language they can speak well and the questionnaire was administered based on the preference of the respondents. The researcher knows the local languages hence the data was collected by the researcher herself. The design of questionnaire did not harm the quality of the data as it did not include any identifying information like name, or address of a person on questionnaire. They also were well informed by the investigator that it is only for the purpose of academic research and not for any other business or illegal activities.

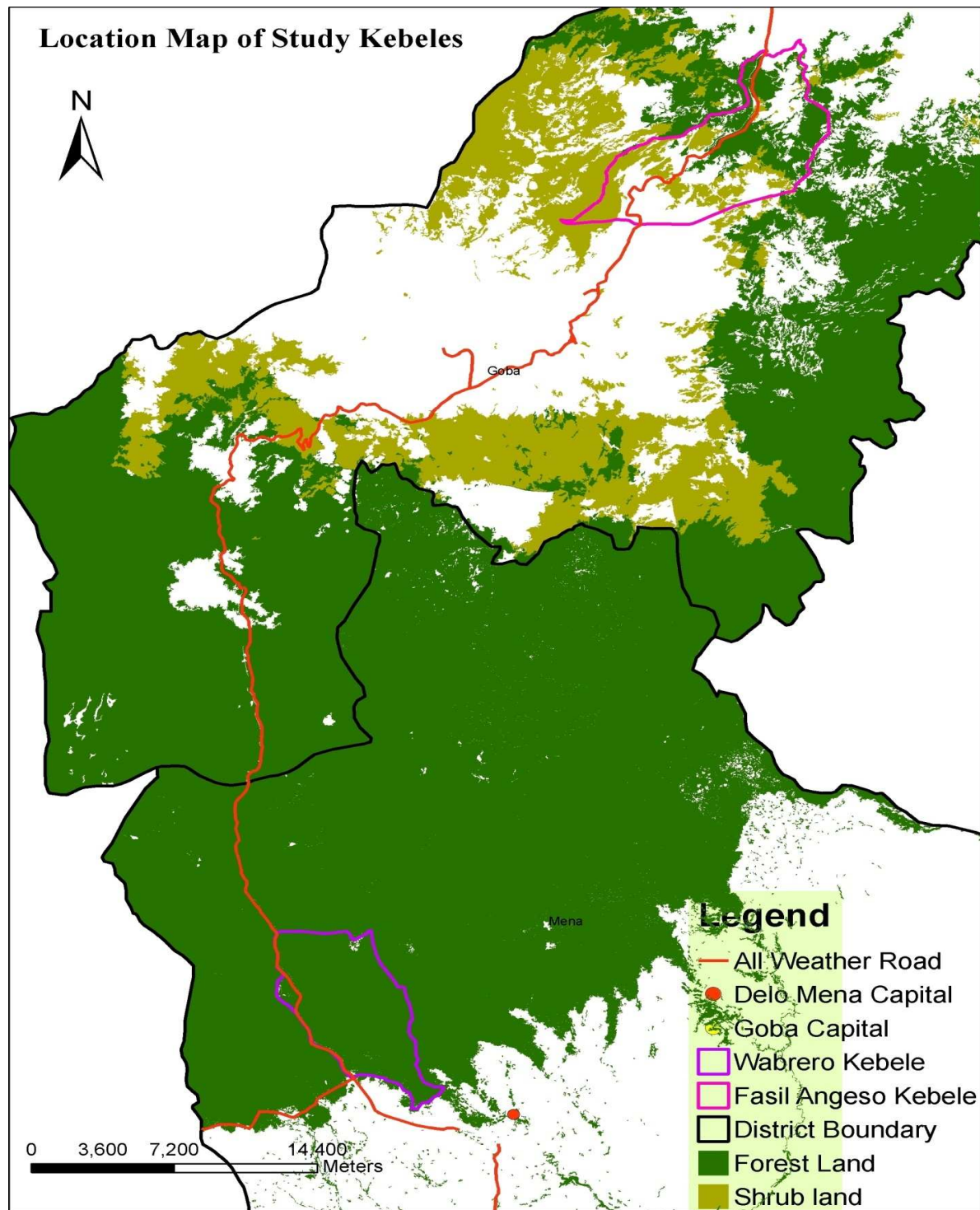


Figure 4.1: Location map of study villages (Kebeles)

4.5 Data Collection Techniques / Instruments of Data Collection

In this study, data collected at the individual level is analysed both at household and community levels. Thus, the unit of data collection is individual while the unit of analysis for this study are communities and households. Data was collected from 80 households, FARM/SOS and Bale forest enterprise staff between December 1, 2009 and January 30, 2010. The data collection process was challenging in Fasil since the respondents were sparsely distributed and the distance between respondent's houses was far. The different data collection techniques used in this study is presented bellow.

Household questionnaire

The household questionnaire was designed with the following objectives in mind.

The first objective was to have a general understanding about household characteristics. Data related to distance from forest, distance from market, household size and some demographic variables (age and sex) were collected. The second objective was to reveal understanding of respondents about PFM. Specifically, knowledge of the respondents about the major activities in formation of Community Based Organizations was evaluated. The third objective was to gather information about the cost and benefits of PFM. Households' understanding about the aim of livelihood diversification programmes was evaluated. This allowed to look at the effect of respondents' understanding about the aim of livelihood diversification programmes on participation. The fourth objective was to collect data about the major household activities and their contributions to total income. The total incomes from each activity were determined and used to make a comparison between the sub villages. Respondents' income from forest was used to estimate the economic value of forest resource to rural livelihoods and to show how diversified livelihood options in the forest affect participation. The final objective was to assess the trainings/information given to the community on PFM.

Interview with the Farm/SOS and Bale forest enterprise staff

This semi-structured interview included all-important variables, which were either difficult or impossible to address in the household questionnaire. The semi-structured interview was

distributed to all staff of Farm/SOS and selected staff (those who worked closely with the project) of Bale forest enterprise.

In the first section of the interview, the performance of the staff was assessed. The objective of assessing the staff's performance was primarily aimed at assessing whether the staffs were well qualified to implement PFM or not. In the second part, of the semi-structured interview, the role of the traditional forest management system as a driver of participation was evaluated.

Assessing the role of the traditional forest management system is important as it can help to explore what impacts it has on the establishment of PFM. The third objective of the semi-structured interview was intended to examine if there is a difference between stakeholders of the two districts and establish if at all this caused variation in participation. The fourth objective of the semi-structured interview was to identify the differences in quality of forest (in terms of providing livelihood options). The result was used to support findings from the household questionnaire. It also helped to examine the effects of this factor on the establishment of PFM. The last objective was to gather information regarding the major livelihood diversification activities performed and the financial support provided by the project so far. Moreover, this information was used to compare and see the difference between the two districts with this regard.

Focus group discussion

As people discuss the way they perceive things with each other, the possibility to reveal their true feeling and understanding about the topic can be increased. This is particularly important to have information people would otherwise like to conceal. In addition, this method is used to have collective view of the respondents. A focus group discussion "...is invariably interested in the ways in which individuals discuss certain issues as a group, rather than simply as individuals." (Bryman, 2008: 473). For such reasons, the researcher has conducted, at each survey site, three focus group discussions. The first team was made up of the committee members, the second team was made up of the community and finally the third team was made up of the women's credit and saving group. The size of the group varied from 6 to 8 people. As mentioned above, the main objective of the focus groups discussion was to give the researcher a broader understanding on how the community perceives the project. Hence, the findings from the

discussions were not presented in the analysis and discussion part. The researcher used the findings to triangulate data collected from the staff and the community via questionnaire and establish the relevancy of such data.

Onsite inspection

To explore facts which people were not willing to disclose and to have more detail information about the issue the researcher used this method. Moreover, information kept secret by the respondents during interview and focus group discussion could be revealed.

Document analysis

Annual performance evaluation reports of Farm/SOS were assessed in detail. This is because these documents have details of planned projects that have been implemented and will broaden the researcher's understanding about the issue under investigation. From the record office of Farm/SOS and previous studies as well, attempts were made to explore and extract required information.

4.6 Data Processing and Analysis

Data processing is an important part of the whole survey operation. It includes manual editing, coding, data entry, data cleaning and consistency checking. The researcher made all these activities of data processing. Descriptive, statistical and econometric analysis methods were used to analyse the collected data. Descriptive tools such as percentages and graphs were employed to present results. Statistical analysis tools such as chi-square tests, two-sample t tests and correlation coefficients were worked out and used to explore the relationships between variables. Econometric analysis was performed to study the effect of explanatory variables on participation. STATA version 9 was used for the analysis.

Empirical model

To explain the observed variation in participation, logistic model in which the dependent variable participation is regressed as a function of the explanatory variables, economic, social, and biophysical was used. The response of the participants as to whether they participate in PFM can

be outlined as a binary-choice model, with an outcome (decision of households) of participation or no participation. The decision of households whether or not to participate in PFM depends on economic, social and biophysical factors (see Table 3.2 for detail explanation of explanatory variables). Simply put, in the logistic model, Y_i represents the dependent variable, participation, which equals to 1 if the respondent participates in PFM and 0 if not. The probability of household participation in PFM, $\Pr(Y_i = 1)$, is a joint probability density function/ likelihood function evaluated at $X_i\beta$, where X_i is a host of explanatory variable and β is coefficient of the predictor variable explaining the change in the dependent variable as a result of a unit change in an explanatory variable.

The estimation form of logistic transformation of the probability of participants' opinions in favor of participation in PFM $\Pr(Y_i = 1)$ can be represented as:

$$\Pr(Y_i = 1) = \frac{\exp(X_i\beta)}{1 + \exp(X_i\beta)}$$

The above equation can be reduced to:

$$\Pr(Y_i = 1) = B_0 + B_1X_1 + B_2X_2 + \dots + B_iX_i$$

Where:

- P is the probability of presence of the characteristic of interest, participation.
- B is the coefficient of the predictor variables and are estimated from calibration data using maximum likelihood technique.
- X is a host of explanatory variables

The dependent variable: The outcome variable is participation of households in PFM, which is coded 1 to signify participation in PFM and zero if not.

Independent variables: refers to a host of explanatory variables assumed to influence respondent's decision to participate in PFM.

The model

The model, which represents participation (coded 1 if the household has participated and 0 if not) and a host of explanatory variables, is given by:

$$P(P)=B_0+B_1(AI)+B_2(IF)+B_3(IFW)+B_4(UALDP)+B_5(PU)+B_6(HHS)+B_7(H)+B_8(DF)+B_9(DM)+B_{10}(A)$$

Where:

- P is a binary dependent variable indicating participation in PFM
- AI is a continuous variable indicating annual gross income of respondents
- IF is a continuous variable indicating proportion of forest income from total income
- IFW is a continuous variable indicating annual income from sales of firewood
- UALDP is a dummy variable indicating understanding of respondents about the aim of livelihood diversification programme
- PU is a dummy variable indicating respondents understanding about the major activities in the different stages of Community Based Organization
- HHS is a continuous variable indicating the number of people who live in a house and/or are economically dependent on the members' living in that house
- H is a dummy variable indicating the place where the households live
- DF is a continuous variable indicating the time to reach the forest in minutes
- DM is a continuous variable indicating the time to reach the nearest market in minutes
- A is a continuous variable indicating the age of the respondents at the time of interview

CHAPTER FIVE: RESULTS AND DISCUSSION

5.1 Survey Site Demographics

Table 5.1: Demographic characteristics of household

| <i>Hamlet</i> | District | DF in min * | DM in min* | Surveyed HH* | Mean age | Mean HH*size |
|---------------|----------|-------------|------------|--------------|----------|--------------|
| Fasil | Goba | 34 | 90 | 30 | 45 | 8 |
| Hadha | Dello | 66 | 75 | 31 | 35 | 7 |
| Befit | Dello | 70 | 37 | 19 | 38 | 6 |

DM= distance from market

DF=distance from forest

HH*= household size

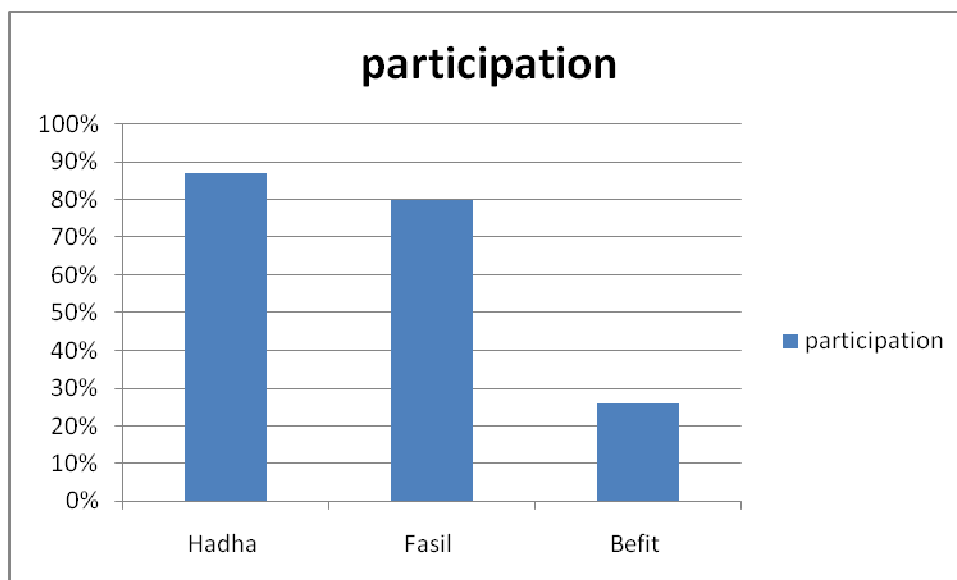
Min*= minute

Source: Survey questionnaire

The total number of households was 365 for Fasil and 1308 for Wabero (Hadha and Befit). The average number of people living in a house was 7, 6 and 8 in Fasil, Befit and Hadha respectively. Compared to Hadha and Befit, Fasil respondents live very close to the forest. Fasil respondents spend 90 minutes on average to reach the nearby market while the average time required for Hadha and Befit respondents to reach the nearby market was 75 and 37 minutes respectively. The average age of respondents was 45, 35 and 38 for Fasil, Hadha and Befit respectively.

5.2 General Information

Figure 5.1 show that the majority of the respondents in Hadha (87%) and Fasil (80%) were members of the Community Based Organizations. Only tiny proportions (26%) of the respondents are members of the Community Based Organization in Befit.



Source: Survey questionnaire

Figure 5.1: Participation in PFM

Respondents who were not members of the Community Based Organization were asked why they were not participating (See Table 5.2). The responses that these respondents gave for not being members of PFM were different. In Fasil, lack of information is the major (66%) reason for not being a member. The two main reasons for Befit respondents for not being members are lack of information (46%) and absence of economic relationship with the forest (30%). In Hadha, the majority of the sample respondents who are not members of PFM (40%) said that the fact that they do not have coffee in the forest was their reason for not participating.

Table 5. 2: Reason for not joining PFM

| Reason | Fasil | Hadha | Befit |
|---|--------|-------|-------|
| Lack of information | 66.70% | 20% | 46% |
| Lack of money to pay for registration fee | 16.70% | 0 | 8% |
| I have no coffee in the forest | 0 | 40% | 30% |
| No reason | 16.70% | 0 | 0 |
| I was not here | 0 | 20% | 16% |
| I don't believe in it | 0 | 20% | 0 |

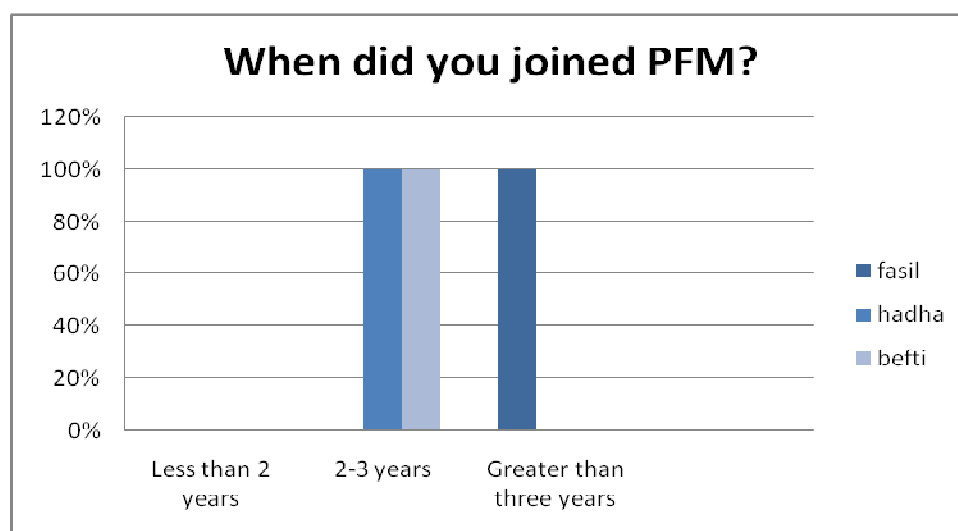
Source: Survey questionnaire

The bar graph depicted below (See Figure 5.2) reveals that all participants from Fasil joined the Community Based Organization after a period of three years. In contrast, all participants from Befit and Hadha joined the Community Based Organization within 2-3 years after they learned about PFM. Fasil respondents were asked why they were late to sign the agreement (see Table 5.3) and the major reasons for their late registration were the lengthy process by FARM/SOS (54%) and lack of willingness from the community's side (21%).

Table 5.3: Why does it take long (more than 3 years) to join PFM?

| No | Reason | | | |
|----|--|--------|-------|-------|
| | | Fasil | Hadha | Befit |
| 1 | Lack of willingness from the community's side | 20.83% | 0% | 0% |
| 2 | The lengthy process by FARM/SOS | 54.16% | 0% | 0% |
| 3 | Lack of money | 4.16% | 0% | 0% |
| 4 | Fear of loss of rights over forest resources and lengthy process of FARM/SOS | 4.16% | 0% | 0% |
| 5 | The lengthy process by FARM/SOS and no follow up | 4.16% | 0% | 0% |
| 6 | The lengthy process by FARM/SOS and the committee has a problem | 4.16% | 0% | 0% |
| 7 | We haven't understood the objective of FARM/SOS | 4.16% | 0% | 0% |
| 8 | Fear of loss of rights over forest resources | 4.16% | 0% | 0% |
| | Total | 100% | 0% | 0% |

Source: Survey questionnaire



Source: Survey questionnaire

Figure 5.2: Time taken between learning about PFM and signing the CBO agreement

Findings from project and Bale forest enterprise also confirmed the difference in performance of staff between the two districts. Project and Bale forest enterprise staffs were asked about the important qualities that staffs of the project need to have in order to assure a faster take up of PFM. Prior work experiences, interest to work closely with the community, self-motivation, and capacity to work independently are the qualities listed by the respondents as the best qualities. All respondents agree on the importance of prior work experience. As to the question on whether there is a difference between the staff of the two districts, 50% of the respondents confirmed that there was difference in performance (See Table below). They also said it could be one of the reasons why PFM establishment is relatively slow in Goba. 25% of them abstained from giving an answer. The remaining 25% said that even though there was difference in quality of staff performance between the two districts, it was not a factor for the difference in establishment of PFM between these two districts.

Table 5.4: Quality of staff

| Question | Answer | | |
|---|--------|-----|-----------|
| | Yes | No | No answer |
| Has the difference in quality of staff resulted in difference in adoption of PFM between the districts? | 50% | 25% | 25% |

Source: Survey questionnaire

It is very important to understand that the primary reason for delayed registrations in Fasil was the lengthy process by FARM/SOS because the decision to participate is partly determined by how well FARM/SOS accomplishes its task. On the other hand, even though this may explain the difference between Fasil and Hadha, it cannot explain the difference between Befit and Hadha as they are found in the same place and administered by the same staffs but differ greatly in participation.

Information provided to the forest management group

FARM/SOS has provided different kinds of information to the committee members and the community. Farmers have visited different areas for experience sharing. The training given to the community includes protection, development and utilization of resources. Information on how to

develop business plan, livelihood diversification and resource assessment is also taught to the community. The information and training is intended to give some inciting information about PFM. From the focus group discussion with the committee members, the researcher understood that communities in Dello have traditional experiences in forest management that almost are similar with PFM. Then, the project and Bale forest enterprise staffs were asked whether this contributes to the slow establishment of PFM in Goba and fast in Dello. The responses from the staff of the project and Bale forest enterprise were mixed. 37.5% of the respondents said that could be one reason. The same percentage of respondents (37.5%) said that this could not be a reason. Had the traditional forest management system benefited Dello district, it would have benefited both Hadha and Befit. However, this was not the case. Thus, the researcher opted to take the position of the group saying that the traditional forest management system did not bring difference in participation between Dello and Goba. The remaining respondents (25%) were not sure whether the traditional forest management system in Dello has something to do with acceptance of PFM.

Respondents who have taken the training in Hadha are 39%. In Fasil, 33% of the respondents got training while in Befit it was only 10%. All the respondents who took part in the training said the information was very relevant. Focus group and discussion with the project staff revealed that Befit community were not told to attend meetings, hence their knowledge about PFM is very limited.

Table 5.5: Information/training given by FARM/SOS

| No | Information | Fasil | | | Hadha | | | Benefit | | | | | |
|----|--|------------------|-----------|---|-------|------------------|------------|---------|------|------------------|-----------|---|------|
| | | Involve- ment | Relevance | | | Involve- ment | Relevance% | | | Involve- ment | Relevance | | |
| | | | 1 | 2 | 3 | | 1 | 2 | 3 | | 1 | 2 | 3 |
| 1 | Protection, development and utilization of forest resource | 33% | | | 100% | 39% | | | 100% | 10% | | | 100% |
| 2 | Development of business plan | 33% | | | 100% | 39% | | | 100% | 10% | | | 100% |
| 3 | Livelihood diversification | 33% | | | 100% | 39% | | | 100% | 10% | | | 100% |
| 4 | Resource assessment | 33% | | | 100% | 39% | | | 100% | 10% | | | 100% |

1 not relevant, 2 quite relevant, 3 very relevant

Source: Survey questionnaire

5.3 Determining Factors of Participatory Forest Management: Descriptive and Statistical Analysis

In this section, varieties of statistical tests were performed in order to determine the relationship between independent variables and participation. Two-sample t tests were performed to find out the relationship and strength of association between participation and continuous independent variables namely, annual gross income, income from forest, income from firewood sales, income from coffee, distance from forest, distance from market, income from livestock, age and household size. The degree of association between participation and selected categorical independent variables, namely, hamlet, understanding of respondents about the major activities in the formation of Community Based Organization, understanding of respondents about the aim of livelihood diversification programme, and involvement in livelihood diversification programmes were established using chi-square tests. A correlation coefficient is also determined to verify the relationship between continuous independent variables. The correlation coefficient was determined to see the magnitude and direction of relationship between variables. Data

collected from project and Bale forest enterprise staff and focus group discussion is used for triangulation purpose.

Table 5.6: Specification of explanatory variables for descriptive statistics

| Variables | Specification | Characteristic of variables | Expected Effects on participation |
|---|---|-----------------------------|-----------------------------------|
| Economic variables | | | |
| Annual gross income | Annual income in birr from all activities | Continuous | + |
| Income from forest | Proportion of income from forest to total income | Continuous | + |
| Firewood sells | Annual income in birr from sales of firewood | Continuous | ? |
| Income from coffee | Annual income in birr from sales of coffee | Continuous | + |
| Livestock income | Annual income in birr from livestock products | Continuous | + |
| Involvement in Livelihood diversification | 0 if not participated 1 if participated | Continuous | + |
| Understanding aim of livelihood diversification programme | 0 if have understanding 1 if no understanding | Categorical | ? |
| Social variables | | | |
| Understanding about Community Based Organization | 0 if no understanding 1 if some understanding | Categorical | ? |
| Household size | Number of people living in the household and/or are economically dependent | Continuous | ? |
| Biophysical variables | | | |
| <i>Hamlet</i> | 0 if they live in Fasil 1 if they live in Hadha 2 if they live in Befit | Categorical | + |
| Distance from forest | Time taken to reach the forest in minutes | Continuous | + |
| Distance from market | Time taken to reach the nearby market in minutes | Continuous | + |

5.3.1 Economic factors and participation

Economic factors are normally expected to positively impact households' decision to participate in PFM. Ethiopia's economy is largely dependent on farming. Agriculture employs about 85% of the population (FARM/SOS,2007). This also holds true for the Bale region area. Farmers in the region are cutting down trees to expand agricultural land. Previous investigation done by FARM/SOS shows that the conversion of forest land to agricultural land is very high in Goba. Findings from staff of the project and FARM/SOS also have proven this same fact. One respondent further explained their difference in the following way: "Dello is lowland with erratic rainfall which is not favourable for agricultural expansion (crop production) whereas, Goba has got bimodal rain (high rainfall) favourable for production of cereals." In addition, they all responded it is one of the main reasons for the difference in uptake of PFM between the districts (See Table 5.7). However, these facts are in contrast to the actual situations on the ground. This is because, first of all, in contrast to what it was affirmed by project and Bale forest enterprise staff, there is a great difference in the level of participation among the two *hamlets* in Dello, namely Befit and Hadha. That is, the level of participation in Hadha is much better than that in Befit. Secondly, even though it was stated that one of the reasons for the low level of participation in Fasil was the high level of agricultural expansion, the level of participation in Fasil is much better than in Befit (where the level of agricultural expansion is low).

Table 5.7: Expansion of agricultural land

| Question | Responses | |
|--|-----------|----|
| | Yes | No |
| Is there any difference in the expansion of agricultural land between the two districts? | 100% | 0% |
| If yes, has this contributed to the slow establishment of PFM in Goba and fast in Dello? | 100% | 0% |

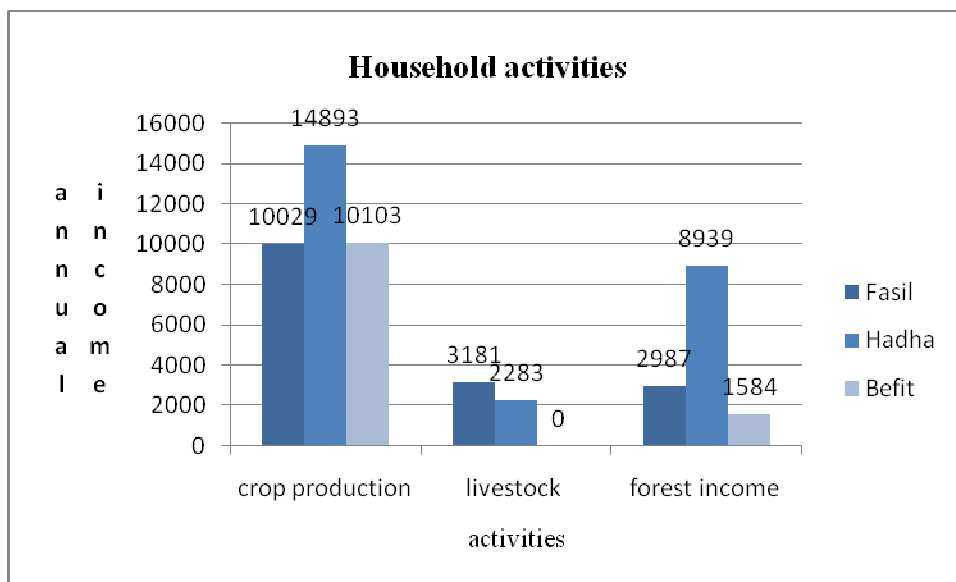
Source: Survey questionnaire

Crop production was reported in both survey sites. Due to the difference in altitude the type of crops grown differ by districts. In Dello wheat, maize, and sorghum are the most commonly grown types of crops whereas barley, potato and onions were commonly grown crops in Goba. Annual income from household activities was calculated using data from the household

questionnaire. The market price survey asked locals residents to record price information at Goba and Dello market. Prices were collected and averaged to obtain the market value for the analysis.

Annual income

Figure 5.3 illustrates the main household activities with their respective mean annual income. The main household activities in Hadha were crop production, livestock rearing, and forest related activities. The same is true for Fasil. In Befit, production of crop takes the lion’s share by contributing about 60% to total income.



Source: Survey questionnaire

Figure 5.3: Main household activity and annual income by *hamlets*

The statistical summary in Table 5.8 illustrates that the mean annual income of respondents differs greatly by *hamlets*. The average annual income for Fasil was 18,191 birr. The mean annual income of Hadha was 27,326 birr and is by far greater than that of Fasil and Befit. In Befit, the average annual income was 15,259 birr.

It is worth noting here that statistical test results show a significant mean annual income disparity by *hamlets*. A two-sample t test shows a significant mean annual income difference between Hadha and Fasil at the 10% level accepting the hypothesis stating mean annual income of Hadha is significantly greater than that for Fasil. Again, the difference in mean annual income between

Hadha and Befit was significant at the 10% level accepting the hypothesis stating mean annual income for Befit is less than that for Hadha.

Table 5.8: Statistical summary of annual income by *hamlets*

| Total income in <i>Hamlet</i> | Observation | Mean | St. dev. | Max | Min |
|-------------------------------|-------------|-------|----------|--------|------|
| Befit | 19 | 15259 | 21584 | 99600 | 3000 |
| Hadha | 31 | 18191 | 29090 | 159600 | 4400 |
| Fasil | 30 | 27326 | 10087 | 4735 | 3320 |

Source: Survey questionnaire

In general, mean annual income was expected to have a significant relationship with participation. As hypothesized, two-sample t test shows a significant positive relationship between participation in PFM and annual gross income at the 1% level accepting the alternative hypothesis that participation depends on the annual income of respondents. A detail of the explanation for this is left to the econometric part (See section 5.4).

Forest income

Table 5.9 shows that the average income from forest related activity was 8,939 birr in Hadha in which coffee contributes the greater proportion. In Befit, the mean annual income from forest was 1,584 birr. In Fasil, the average annual income from forest was 2,987 birr. A two-sample t test shows a significant difference in mean annual forest income between *hamlets*. The mean annual income from forest in Hadha was significantly greater than Befit at the 1% level. Similarly, there was a significant difference in mean annual forest income between Fasil and Hadha at the 1% level.

Finally, there is a statistically significant association between participation and respondents' forest income. Two-sample t test proved that the mean annual income for participants is greater than the mean annual income of non-participants. Accordingly, a household who belongs to the Community Based Organization, on average, generate more income from forest at the 1% level than their respective counterpart does (see section 5.4 for detail explanations).

Table 5.9: Statistical summary of forest income by *hamlets*

| Forest income in <i>hamlet</i> | Observation | Mean | St. dev. | Max | Min |
|--------------------------------|-------------|------|----------|-------|------|
| Befit | 19 | 1584 | 4175 | 17600 | 0 |
| Hadha | 31 | 8939 | 7906 | 32000 | 1750 |
| Fasil | 30 | 2987 | 2589 | 9840 | 0 |

Source: Survey questionnaire

As it can be vividly seen in Table 5.9, the selling of forest products was reported in all surveyed *hamlets*. The main source of income from forests were firewood sales, wild coffee and camp honey. No household in Fasil reported income from coffee and honey as forest income. By contrast, households in Hadha and Befit had generated all their forest income from coffee and/or honey. Response from open-ended question forwarded to the staff of the project and Bale forest enterprise also clearly showed this. “Due to the variation in altitude, the type of forest product produced in the two districts varies greatly. Dello forest is a moist tropical forest while Goba forest is mountain forest”, said project and Bale forest enterprise staff.

Project and enterprise staff also believes that altitude (which in turn influence income from forest) is a determinant factor for successful establishment of PFM. They added the difference in livelihood opportunity in the forests has brought about differences. People’s livelihood in Dello primarily depends on coffee, which is relatively forest friendly. As a result, communities would love to keep the forest and are ready to embrace PFM. Nevertheless, in the highlands, like Goba, farmers are primarily living on crop production, which does not usually happen under shed; therefore, people would love to clear the forest and expand crop production. Hence protecting the forest is not their priority.

The above findings from project and enterprise staff look as if it is in contrary to the findings from household survey which shows statistically significant *hamlet*-wide difference in annual forest income and participation (between Befit and Hadha being in same district). However, detail analysis of the case can enable to reconcile it with the findings from the household questionnaire. This is because as they (project and enterprise staff) tried to relate altitude to forest product (production of coffee and honey) what matters is not only living in Dello (altitude) but also the economic benefits from forests. Thus, the limited amount of mean annual income

from forest in Befit can explain the observed difference between the two *hamlets* (Befit and Hadha).

Firewood income

Threats to the Bale eco region area are growing rapidly. “The forests are not being managed properly and local people are fast depleting the resources-cutting down trees... and to create firewood and charcoal to sell” (FARM/SOS, 2008:29). The report added that the high demand for fuel wood in Goba contributes to the slow establishment of PFM in the surrounding villages (like Fasil).

Excessive fuel wood flow from the surrounding mountains to Goba town seems unstoppable. The prevailing free riding condition over the natural resources is going even farther to hindering communities’ willingness of taking up sustainable resource management and wise utilization opportunities (FARM/SOS, 2008).

In Fasil, the only way through which the community generates income from forests is firewood sales. Figure 5.4 illustrates that firewood sales in Fasil represents about 20% of their total income. No household in Befit and Hadha reported income from firewood sales. Regardless of their engagement in firewood sales, the majority of the households (80%) in Fasil had participated in the PFM. Thus, there is a positive association between participation and income from firewood sales.

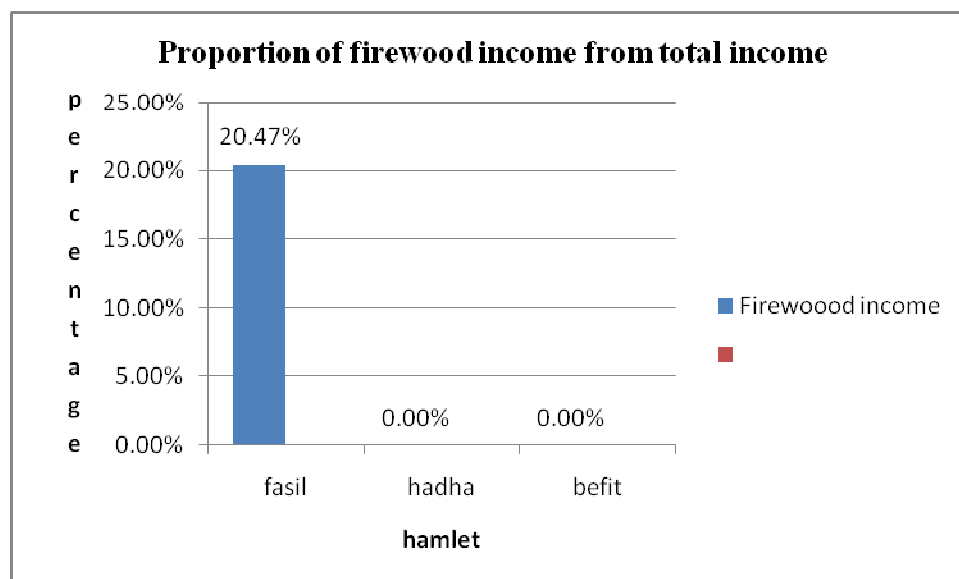
The above finding from household survey is further strengthened by two-sample t test demonstrating a significant positive relationship at the 10% level between firewood sales and participation. By contrast, to this, findings from project and enterprise staff indicate a negative relationship between participation and firewood sales. “There is a tangible difference (in terms of firewood demand) between the districts”, project and Bale forest enterprise staff said. 75% of the respondents believe that the difference in fuel wood demand between Goba and Dello was one of the causes for the difference in take-up of PFM (See Table 5.10). Here, the researcher opted to deviate from the finding from project and enterprise staff. The explanation for this can be the following. PFM is a process through which people share the benefits of forest resources through contribution to forest protection and development. Households/communities who do not

contribute to protection and development have no rights to share benefits from common resources. Thus, the households may have a fear that if they refuse to participate in PFM, their rights to make use of common resources may be restricted and hence decided to participate. This is inline with the finding of Shrestha who found that firewood requirement has positive effect on conservation of forest resources (Shrestha, 1988). Again, the difference between Befit (who do not involve in firewood sale but the proportion of participants is only 26%) and Fasil (sale firewood but their rate of participation is high, 80%) can explain that the findings from project and Bale forest enterprise staff is questionable.

Table 5.10: Demand for firewood

| Question | Responses | |
|--|-----------|-----|
| | Yes | No |
| Has the difference in firewood demand in the nearby markets contribute to the slow establishment of PFM in Goba and fast in Dello? | 75% | 25% |

Source: Survey questionnaire



Source: Survey questionnaire

Figure 5.4: Proportion of firewood income to total income

Income from coffee

Ethiopia is the oldest coffee exporter in the world. Coffee is the important cash crop and contributing between 10- 15% to GDP. Ethiopia produces about 200,000 to 250,000 tons of coffee every year. Small farmers produce about 90% of Ethiopia's coffee and government owned farms produce the remaining (Admin, 2006).

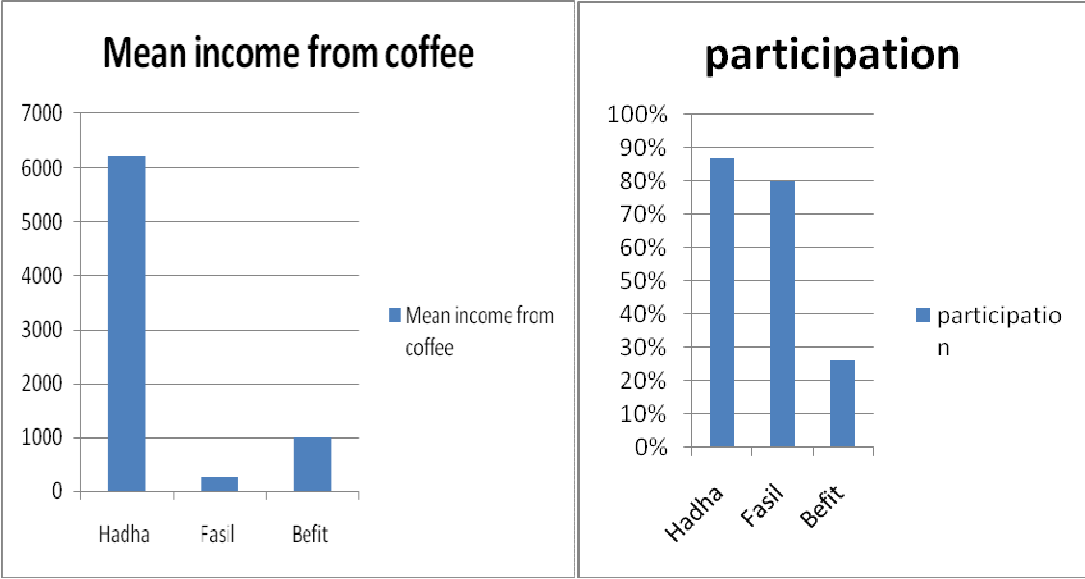
Table 5.11 illustrates that the mean annual income from coffee was 6,236 birr and 1,000 birr for Hadha and Befit respectively. In Fasil, only two respondents who have coffee land in other places (Dello) generated income from coffee. Figure 5.5 clearly shows that income from coffee greatly differed by *hamlet*. Similarly, two-sample t test shows Hadha has significantly higher value than Fasil at the 1% level and, Befit at 5% level.

Table 5.11: Statistical summary of annual income from coffee by *hamlets*

| Annual income from coffee in <i>Hamlet</i> | Observation | Mean | St.dev. |
|--|-------------|------|---------|
| Befit | 19 | 1000 | 2227 |
| Hadha | 31 | 6236 | 5748 |
| Fasil | 30 | 266 | 1142 |

Source: Survey questionnaire

Finally, it was hypothesized that income from coffee has positive and significant relationship with participation. Two-sample t test confirmed the hypothesis that there exist a positive association between the two variables at the 1% level. Thus, it was very logical to assume that one of the reasons for non-participation of Befit was because they do not have coffee in the forest. Focus group discussion with the committee members also revealed that Befit community was not expected to participate since they do not have coffee in the forest.



Source: Survey questionnaire

Figure 5.5 : Income from coffee and participation

Income from livestock

Ethiopia’s livestock population is believed to be the largest in Africa. With the greatest concentration in the high lands, livestock is distributed throughout the country. Livestock contributes about one-third to the agricultural sector or nearly 15 percent of total GDP (Flintan et al, 2008). In Ethiopia, fodder for livestock is mainly grass and natural forests making livestock production one of the reasons for the degradation of forest resources. In this study, annual income from sales of livestock was used to measure the annual livestock income of the respondents. Income from livestock only includes live animals sold in a year and not animal products (like milk, butter, egg etc). This is because respondents were not able to remember the exact value of these products.



Figure 5.6: Pastoralist in Dello: Movement of people with their cattle

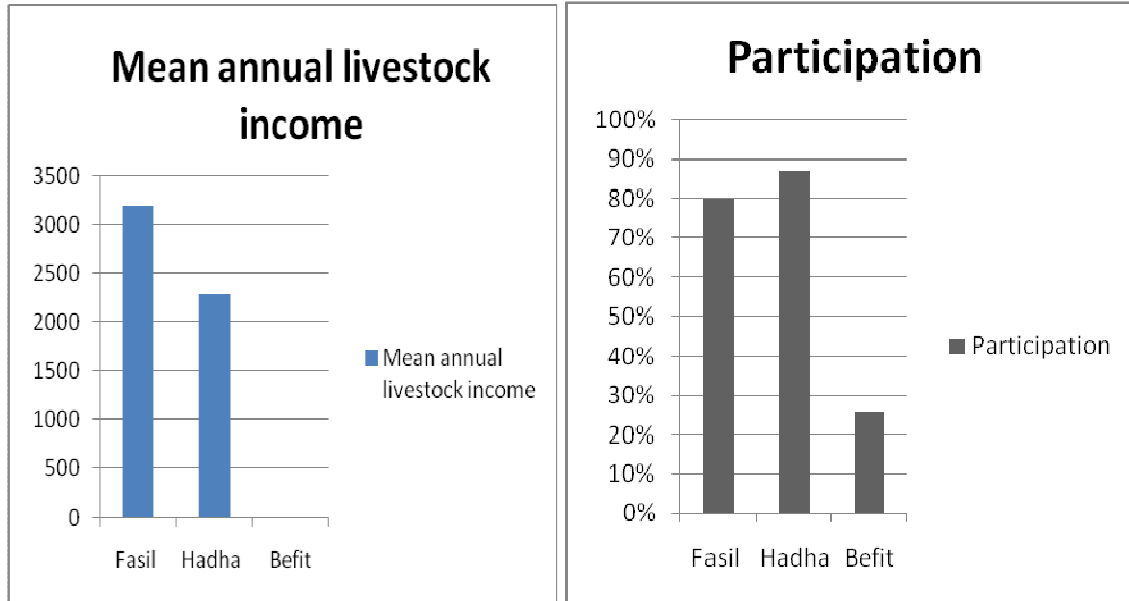
Table 5.12 illustrates that income from livestock greatly differs by *hamlet*. The average annual income from livestock product for Hadha respondents was 2,284 birr. In Fasil respondents mean annual income from livestock product was 3,182 birr. No respondent from Befit reported income from livestock. Similarly, two-sample t test shows that the mean annual income from livestock does not significantly differ between Hadha and Fasil. However, the mean annual income in Befit is significantly less than that in Hadha at the 5% level.

Finally, two-sample t test shows that the relationship between income from livestock and participation is significant at the 5% level. This finding is in line with Chhetri (2005) who found that, as greater supply of fodder from forest sources increase, dependency of the community on forests and thereby willingness to manage them increases proportionally. The relationship between the two variables is further explained by Agrawal and Chhatre (2006). They recommended that scholars have to take animal as well as human population into account while analyzing participation in forest resource management. This is because consumption pressures on forest can be high even with low human population pressures if per household animal holding are high in turn increasing household participation in the management of forest resources. This can also explain the positive relationship between the two variables. As income from livestock has a positive relationship with participation, the researcher assumes that it can justify why Fasil respondents participated than those in Befit given the fact that their income from coffee and honey is very limited.

Table 5.12: Statistical summary of annual income from livestock by hamlets

| Livestock income in <i>Hamlet</i> | Observation | Mean | St. dev. | Max | Min |
|-----------------------------------|-------------|------|----------|-------|-----|
| Befit | 19 | 0 | 0 | 0 | 0 |
| Hadha | 31 | 2284 | 705 | 30000 | 0 |
| Fasil | 30 | 3181 | 1032 | 15000 | 0 |

Source: Survey questionnaire



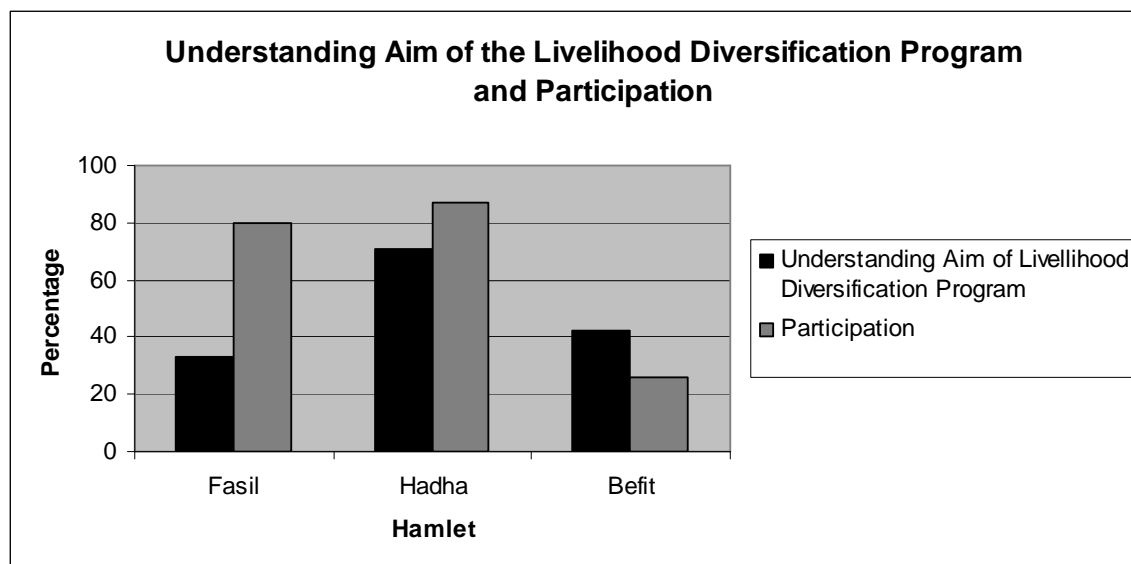
Source: Survey questionnaire

Figure 5.7: Livestock income and participation

Understanding aim of the livelihood diversification programme

The main objectives of PFM are environmental conservation and improving the livelihood of the community. 71%, 42%, and 33% of the respondents in Hadha, Befit and Fasil respectively have understanding about the aim of different livelihood diversification programmes of FARM/SOS. Chi-square test shows that, Hadha respondents' have better understanding about the aim of livelihood diversification programme than both Befit (at the 5% level) and Fasil (at the 1% level).

It can be simply observed from Figure 5.8 that, participation and understanding about the aim of livelihood diversification programme has positive relationship. The chi-square test (at the 5% level) also strengthened this finding by showing that participation depends on respondents understanding about the aim of the programme.



Source: Survey questionnaire

Figure 5.8: Understanding aims of livelihood diversification programme and participation

Involvement in livelihood diversification programme

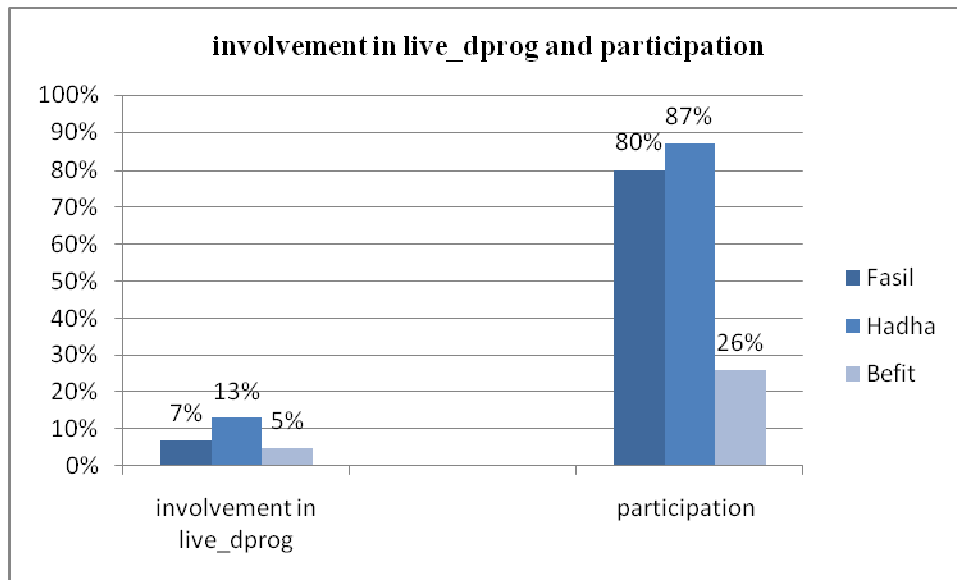
According to the data collected from project and Bale forest enterprise staff, the livelihood diversification programme implemented so far includes essential oil trial production, distribution of coffee drying bed, Warburgia plant, investment in improved honey production, apple seedlings distribution to farmers, credit and saving service for women and encouraging the set up of new natural products businesses.

Of the entire livelihood diversification programme, only distribution of coffee drying bed and the women saving and credit services are functioning well in Wabero. Focus group discussions with the committee members revealed households from Befit were involved in neither of the livelihood diversification programmes performed in Wabero. They added this was mainly because of two reasons. First, only few households from Befit have coffee in the forests. Second, the majority of them were not native. Consequently, the project staff as a target group did not consider them.

The livelihood diversification programmes implemented in Fasil were saving and credit service for women and apple tree. None of these activities was successful enough to generate economic benefits. Focus group discussion with committee members revealed that, apple tree programme

has failed because of lack of follow up by FARM/SOS. The women's credit and saving association also did not get anything from FARM/SOS yet. "FARM/SOS promised to give us financial support but no one showed up after that," said the women's saving and credit group. These are inline with the findings from project staff. All respondents from both FARM/SOS and Bale forest enterprise said that there is a difference in livelihood diversification activities performed in Dello and Goba. The presence of livelihood options in Dello gave an opportunity for the community to get support from the programme. This is partly because FARM/SOS livelihood diversification programme focus on forest based livelihood diversification. Even though focus group discussion and interview with project and Bale forest enterprise staff revealed district-wide difference in livelihood diversification performed, findings from the household survey does not confirm so. Result from statistical test (chi- square) shows the absence of statistically significant difference between *hamlets* as far as livelihood diversification is concerned.

Figure 5.9 reveals a positive relationship between participation and involvement in livelihood diversification programme. The finding is further strengthened by the chi-square test. The chi-square test showed a significant relationship between participation and involvement in livelihood diversification programme at the 1% level. This may have future implication for the project to consider non-forest based product livelihood diversification programme while implementing its project in places like Fasil where the forest is poor in its quality to support the forest based livelihood options.



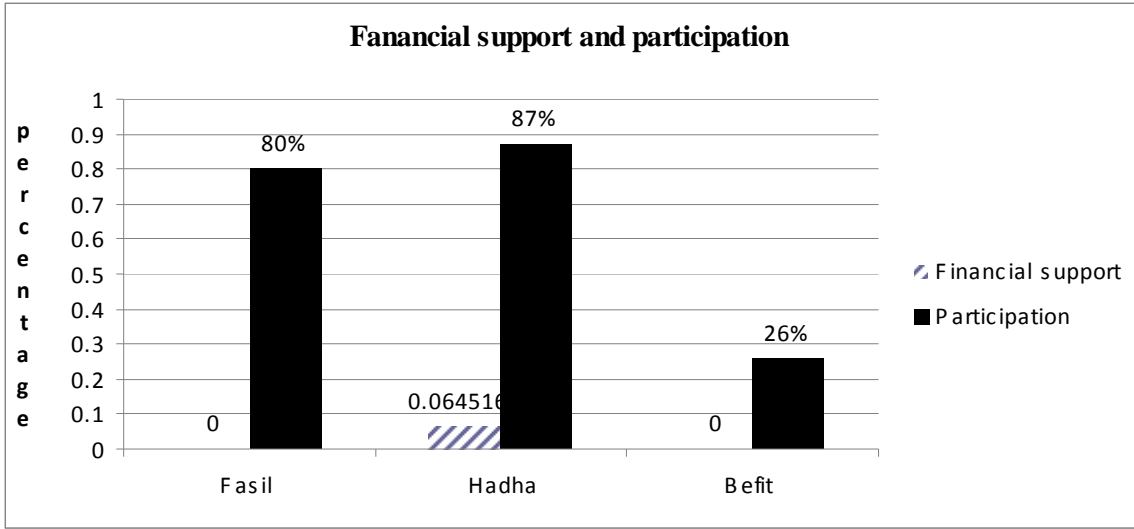
Source: Survey questionnaire

Figure 5.9: Involvement in livelihood diversification programme and participation

Financial support provided

The livelihood diversification programme includes providing financial support to individual and/or group who sought to perform forest based livelihood activities. Although this was stated as objective of the project, the performance report does not confirm so (FARM/SOS, 2008).

Results from survey questionnaire strengthen this finding. Only two respondents from Hadha get financial support from FARM/SOS. No respondents from Fasil and Befit reported that they get financial support from the project. Pearson chi-square test shows that there is no significant difference between those who get the support and who do not as far as participation is concerned.

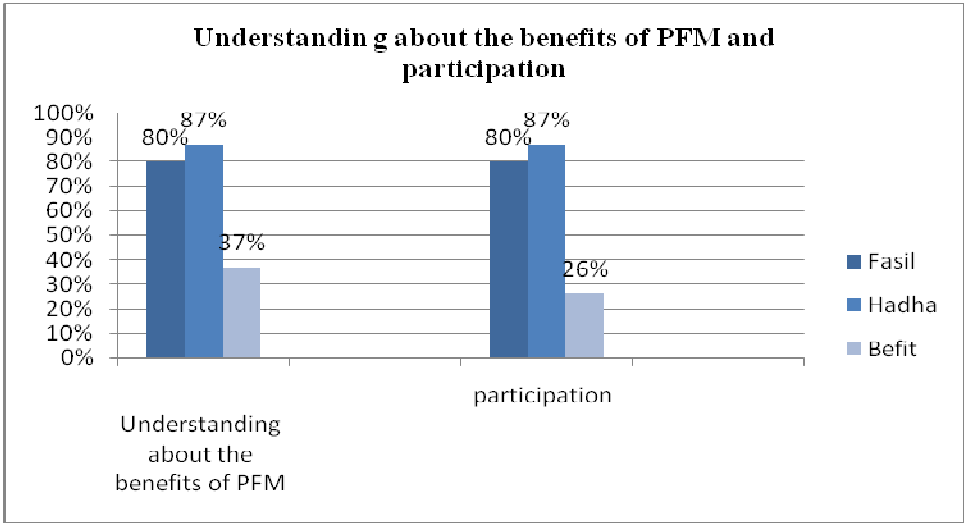


Source: Survey questionnaire

Figure 5.10: Financial supports and participation

Knowledge of respondents about benefits and economic losses of PFM

Respondents in Hadha have good understanding about the benefits of PFM followed by those in Fasil and Befit. Conservation of forest resource, improving livelihood, sustainability of production, and legal use rights over forest resources are some of the benefits of PFM listed by the respondents. Respondents were also asked about the economic losses of PFM. 73%, 90% and 37% from Fasil, Hadha and Befit replied that PFM has no economic losses.



Source: Survey questionnaire

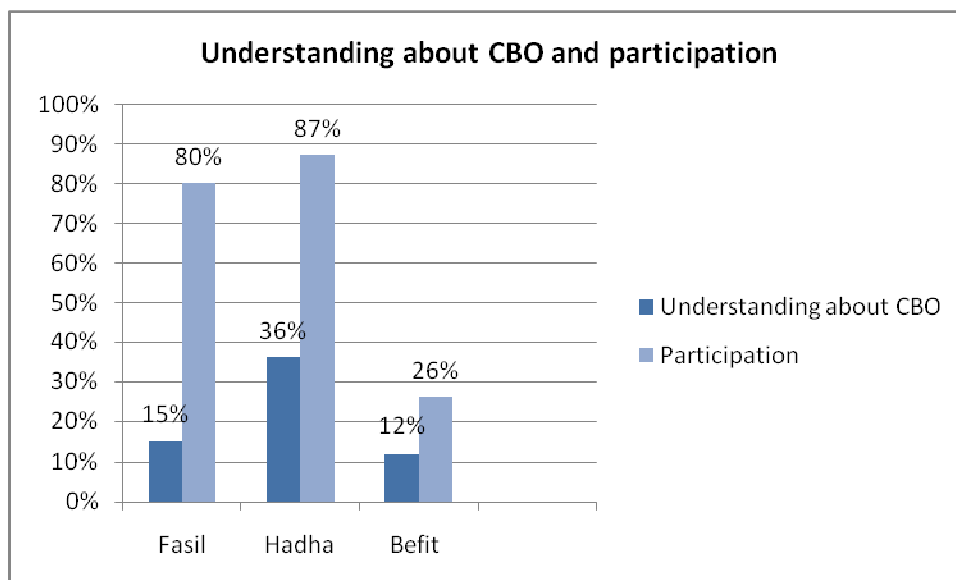
Figure 5.11: Understanding about the benefits of PFM and participation

5.3.2 Social factors and participation

Perception/understanding of the community

Perception of respondents was measured by respondents' level of understanding about Community Based Organization. The level of understanding in turn was measured by respondents' knowledge about the different activities of Community Based Organization including how laws were set, who made the laws and major stages of Community Based Organization.

As it can be clearly seen from Figure 5.12, only 15% , 36% and 12% of the respondents have knowledge about the entire process of Community Based Organization in Fasil, Hadha and Befit respectively. Hadha respondents have relatively better understanding than both Befit and Fasil.



Source: Survey questionnaire

Figure 5.12: Understanding about major activities in CBO formation and participation

Statistical test performed using Pearson chi-square also confirmed the *hamlet*- wide difference in understanding. Accordingly, the level of Hadha respondents' understanding was by far better than that of Fasil at the 5% level and Befit at the 1% level. Focus group discussion with the committee members in Fasil revealed that the training and/or education given to create

awareness about the programme were not enough. They added that, project staffs lack commitment because they failed to give the training on a regular basis. It is very interesting to learn that the reason for the low level of understanding in Fasil was partly the lack of commitment from the project staff. This will have future implication for the project to provide the training appropriately so that the establishment process ends up with success.

Finally, Pearson chi-square test shows a positive relationship between participation and understanding at the 5% levels accepting the hypothesis stating households with high level of understanding are expected to join the PFM than households with low understanding.

Household size

Table 5.13 illustrates that the average household size is 6, 7, and 8 for Befit, Fasil and Hadha respectively. The average household size in the three *hamlets* does significantly differ from the country's average, which stands at 6. Results from two-sample t test shows that respondents in Hadha have significantly higher family size than those both in Befit and Fasil at the 10% level. In general, there was a significant association between participation and household size at the 10% level. Thus, the results strongly support the argument that the households with larger family size are in better position to participate in community forest management while the opposite is true for households with small family size (Chhetri, 2005).

Table 5.13: Statistical summary of household size by *hamlets*

| Household size in <i>Hamlet</i> | Observation | Mean | St. dev. | Max | Min |
|---------------------------------|-------------|------|----------|-----|-----|
| Befit | 19 | 6 | 2 | 10 | 1 |
| Hadha | 31 | 8 | 4 | 21 | 1 |
| Fasil | 30 | 7 | 3 | 16 | 2 |

Source: Survey questionnaire

5.3.3 Biophysical factors and participation

Hamlets

Because of the difference in altitude and other factors discussed in the description of variables and hypotheses section, significant variation in participation between *hamlets* was expected. It was assumed that some *hamlets* have a significant positive relationship with participation while

others do not. Pearson chi-square test was made to see the difference in participation between *hamlets*. Chi-square test shows that the variation in participation between Hadha and Fasil is not statistically significant. The other hypothesis tested was whether there is difference in participation between Befit and Hadha. Fortunately, the chi-square value confirmed the expected relationship by accepting the alternative hypothesis that Hadha respondents participate in PFM than Befit because of the place where they are living. It is not unusual to take *hamlet* (commonly named district in literature of commons) as a determinate factor of participation in forest resource management. Agrawal and Chhatre (2006) in their study in India found that *hamlet* is a determinate factor for success of common resource management.

Distance from forest and distance from market

It was hypothesized that the closer the residence of the respondents to forest the higher the chance of the households to participate. However, two-sample t test score does not show any significant relationship linking distance from forest and participation. This result implies that the time required to reach the community forest does not play a role in whether a household decides to participate or not in forest management activity. Or simply said, distance from forest has nothing to do with the decision of whether to participate or not. This may be because the community has realized the importance of forest in their livelihoods. That is, the community realized that they could not longer get access to firewood easily due to the scarcity of forest resources (also caused by continuous cutting of trees for firewood purposes) and that the better choice was to get such access by involving in PFM. In addition, the restrictions put on the access to coffee in the CBO agreement 'forced' the community to join PFM to get such access. These factors could explain the similarity in attitude with regards to willingness to participate.

Similarly, it was expected that the closer the respondents were to the nearby markets the more they were willing to participate. Against the expectation, however, two-sample t test show the inverse of what has been hypothesized at the 5% level, accepting the null hypothesis that the closer the respondents are to the market the lesser is their willingness to participate. Although the result contrasts with the finding of scholars of common who have significant literature on the effect of roads and markets, it is inline with the works of recent scholars of commons such as, Argawal (2006) and (Gautam, Shivakoti, & Webb 2004, cited by Argawal, 2006). A survey in

Western Honduras found that forests located in rural areas experienced a proportionately higher amount of net protection and gain than forests in urban area (Southworth & Tucker, 2001). This can also explain the unexpected inverse relationship between distance from market and participation.

Table 5.14: Statistical summary of distances from forest and market by hamlets

| Distance from forest in <i>Hamlet</i> | Observation | Mean | St. dev. | Max | Min |
|---|-------------|------|----------|-----|-----|
| Befit | 19 | 70 | 21 | 30 | 120 |
| Hadha | 31 | 67 | 56 | 180 | 15 |
| Fasil | 30 | 34 | 39 | 180 | 0 |
| Distance from market in minutes in <i>Hamlets</i> | | | | | |
| Befit | 19 | 37 | 7 | 45 | 15 |
| Hadha | 31 | 75 | 36 | 180 | 30 |
| Fasil | 30 | 90 | 31 | 180 | 60 |

Source: Survey questionnaire

Table 5.15: Correlation between continuous independent variables and participation

| | hsize | dist_m~t | dist_f~t | hours | totali | coffeei | I_fire~s | livest | parici |
|--------------|-----------|-----------|----------|----------|-----------|----------|----------|--------|--------|
| Hsize | 1.0000 | | | | | | | | |
| dist_market | 0.1561 | 1.0000 | | | | | | | |
| | 0.1667 | | | | | | | | |
| dist_forest | -0.0193 | -0.0506 | 1.0000 | | | | | | |
| | 0.8648 | 0.6560 | | | | | | | |
| Hours | 0.1498 | 0.0336 | -0.0233 | 1.0000 | | | | | |
| | 0.1849 | 0.7673 | 0.8375 | | | | | | |
| Totali | 0.2519 | 0.0034 | -0.0206 | 0.2194 | 1.0000 | | | | |
| | 0.0242 | ** 0.9762 | 0.8563 | 0.0505** | | | | | |
| Coffeei | 0.2890 | 0.0249 | 0.0941 | 0.2079 | 0.7474 | 1.0000 | | | |
| | 0.0093*** | 0.8263 | 0.4065 | 0.0643* | 0.0000*** | | | | |
| I_firewood~s | -0.0894 | 0.2251 | -0.1417 | 0.1924 | -0.0852 | -0.2749 | 1.0000 | | |
| | 0.4305 | 0.0447** | 0.2098 | 0.0873* | 0.4522 | 0.0136** | | | |
| Livestchockt | 0.2229 | 0.2003 | -0.1167 | 0.2029 | 0.6743 | 0.4835 | 0.0556 | 1.0000 | |
| | 0.0469** | 0.0748* | 0.3027 | 0.0711* | 0.0000* | 0.0000* | 0.6240 | | |
| Partici | 0.2709 | 0.1985 | -0.0427 | 0.2364 | 0.2707 | 0.2673 | 0.1715 | 0.2109 | 1.0000 |
| | 0.0151** | 0.0776* | 0.7072 | 0.0347** | 0.0152** | 0.0166** | 0.1281 | 0.0603 | |

***significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

The correlation Table above shows the relationship between variables. As depicted above, there is a strong correlation between income from coffee and total income and between livestock and total income at the 1% level of significance

5.4 Determinating Factors of Participatory Forest Management: Econometric Analysis

In order to answer the research questions in this study, the researcher chose to use the logistic regression model. Classical model specification tests for multicollinearity (correlation) and heteroskedasticity (robust standard error) were made so that the data meets the assumptions underlying the logistic regression model.

Due to the results revealed by the multicollinearity test, livestock income is excluded when running the logistic regression. This is because, as it can be vividly seen from the correlation Table above (see Table 4.12), there is high association between income from livestock and total income of respondents. The coefficient of correlation between income from coffee and livestock income is also large. Thus, the researcher dropped livestock income for multicollinearity effect. Again, income from coffee is excluded when running the logistic regression. This is because there is high correlation between income from coffee and total income of respondents (see table 4.12). This variable has also a strong correlation with forest income. Thus, the researcher dropped coffee income for multicollinearity effect.

The test for normality of the data has revealed that Forest income is skewed to the left. Hence, the variable was transformed to its square root to correct non-normality. Similarly, distance from forest was skewed to the left and transformed to its square root to correct such non-normality. Distance from market, household size and total income were all skewed to the left and transformed into their log value to validate the normality assumption.

An In-depth discussion of factors that determine decisions of the community, i.e., whether or not to participate in common resource management, were given in the literature review part (See Table 3.1). In this section, only context specific factors, which were assumed very relevant for this study, are discussed. Participation in PFM is the dependent variable. The explanatory variables for logistic estimation were presented in the third chapter (See Table 3.2)

Determinating factors for successful establishment of PFM

A logistic regression (reporting odds ratios) is performed to determine the joint effect of different independent variables on participation and to explore the reason why PFM establishment is slow in some of the sites and relatively fast in others. The odds ratio shows the strength of association between a predictor and the responses of interest. The estimated model, taking participation as the dependent variable along with other biophysical, social and economic as explanatory variables, is presented in Table 5.14. The logistic estimation result shows that about 45% of the variation in the dependent variable is explained by the variation in the explanatory variables. The over all significance and fitness of the logistic model is determined by its chi-square value. The chi-square value is $Pr = 0.0000$ thus the explanatory variable can significantly predict the dependent variable.

Robust standard error was used to minimize the problem of heteroskedasticity. A Logit estimate with non-robust standard error is presented below for comparison between the two results.

Table 5.16: Logistic estimate with odds ratios and non-robust standard error

| Variables | Odds Ratio | Std.err. | Z | P> z |
|---|------------|----------|-----------|---------|
| Understanding aim of the programme (1= yes,0=no) | 3.229315 | 2.749047 | 1.38 | 0.168 |
| Understanding about formation of CBO (1 = yes, 0 = no) | .8166627 | 1.131782 | -0.15 | 0.884 |
| Proportion of forest income to total income | 165.2138 | 339.7785 | 2.48 | 0.013* |
| Total annual income | 3.631624 | 2.43024 | 1.93 | 0.054** |
| Hamlet1 (0= Fasil, 1= Hadha,2=Befit) | .0989201 | .1607797 | -1.42 | 0.155 |
| Hamlet2(0= Fasil, 1= Hadha,2=Befit) | .0232046 | .0432946 | - 2.02 | 0.044* |
| Household size | 2.254095 | 1.631431 | 1.12 | 0.261 |
| Distance from market | .2107769 | .2576303 | -1.27 | 0.203 |
| Distance from forest | .9804743 | .1182712 | -0.16 | 0.870 |
| Income from firewood sales | .9996939 | .0003105 | -0.99 | 0.324 |
| Age | 1.019614 | .0327631 | 0.60 | 0.546 |
| <p>Note1: *5% significance level, **10% significance level Note2: Log likelihood = -26.734415 LR chi2(11) = 44.27 Prob > chi2 = 0.0000 Pseudo R2 = 0.4529</p> | | | | |

Source: STATA result

Table 5.17: Logistic estimate with odds ratios and robust standard error

| Variables | Odds Ratio | Std.err. | z | P> z |
|---|------------|----------|-----------|---------|
| Understanding aim of the livelihood diversification programme (1= yes,0=no) | 3.229315 | 2.344604 | 1.61 | 0.106** |
| Understanding about formation of CBO (1 = yes, 0 = no) | .8166627 | .8708967 | -0.19 | 0.849 |
| Proportion of forest income to total income | 165.2138 | 407.7518 | 2.07 | 0.039* |
| Total annual income | 3.631624 | 2.68599 | 1.74 | 0.081** |
| Hamlet1(0= Fasil, 1= Hadha,2=Befit) | .0989201 | .2006355 | -1.14 | 0.254 |
| Hamlet2 (0= Fasil, 1= Hadha,2=Befit) | .0232046 | .0494572 | - 1.77 | 0.077** |
| Household size | 2.254095 | 1.497805 | 1.22 | 0.221 |
| Distance from market | .2107769 | .3281214 | -1.00 | 0.317 |
| Distance from forest | .9804743 | .0951382 | -0.20 | 0.839 |
| Income from firewood sales | .9996939 | .0003265 | -0.94 | 0.349 |
| Age | 1.019614 | .0317609 | 0.62 | 0.533 |
| <p>Note1: *5% significance level, **10% significance level</p> <p>Note2:</p> <p>Log likelihood = -26.734415</p> <p>Wald chi2(11) = 40.28</p> <p>Prob > chi2 = 0.0000</p> <p>Pseudo R2 = 0.4529</p> | | | | |

Source: STATA result

Table 5:17 presents the result of the regression analysis in which forest income (at the 5% level), total income (at the 10% level) and *hamlet2* (at the 10% level) are significant. Even though, understanding the aim of livelihood diversification programme is significant at slightly greater than the 10% level, the positive coefficient indicates that households who have understanding about the aim of livelihood diversification programme are most likely to participate than those who do not have. Some of the observed effects in logistic estimation, however, do not conform to the stated hypothesis in the previous section (See section 3.5). Sales of firewood do not show any significant effect on participation rejecting the earlier hypothesis that firewood sales may have a negative effect on participation. Distance from forest was hypothesized to have negative effects on participation, however; the logistic estimation shows that distance from forest is insignificant in its power to influence household decision on participation. Similarly, household size is insignificant in its power to influence household decision on participation. The same is true for understanding about the main activity in Community Based Organization, age and distance from market.

Table 5.18: Logistic estimation reporting marginal effects

| Variable | dF/dx | Std.err. | z | P> z | x-bar |
|--|-----------|----------|-------|---------|---------|
| Understanding aim of livelihood diversification programme (1= yes,0=no) | .1918196 | .13295 | 1.44 | 0.149 | .5 |
| Understanding about formation of CBO (1 = yes, 0 = no) | .0342602 | .18497 | 0.19 | 0.853 | .2125 |
| Proportion of forest income to total income | .8353623 | .40088 | 2.08 | 0.037** | .411521 |
| Total income | .2109456 | .10569 | 2.00 | 0.046** | 9.6463 |
| Hamlet1 (0= Fasil, 1= Hadha,2=Befit) | -.4212143 | .37207 | -1.13 | 0.258 | .3875 |
| Hamlet2(0= Fasil, 1= Hadha,2=Befit) | -.7246422 | .28133 | -2.58 | 0.010* | .2375 |
| Household size | .1329366 | .11159 | 1.19 | 0.234 | 1.82704 |
| Distance from market | -.2546623 | .24379 | -1.04 | 0.296 | 4.15957 |
| Distance from forest | -.0032253 | .0159 | -0.20 | 0.839 | 6.65296 |
| Income from firewood sales | -.0000501 | .00005 | -0.94 | 0.347 | 1070.25 |
| Age | .003177 | .0051 | 0.62 | 0.533 | 38.95 |
| Note1: *1% significance level, **5% significance level, ***10% significance level | | | | | |
| Note2: Log likelihood = -26.734415 Wald chi2(11) = 40.28 Prob > chi2 = 0.0000 Pseudo R2 = 0.4529 | | | | | |

Source: STATA result

In the above paragraph, the effect of predictor variables was discussed using odds ratios. In the forthcoming part, the effects of variables are presented and interpreted using their marginal value. The odds ratio takes values between zero and positive infinity and the effect of explanatory variable are explained as a factor. The marginal effect explains the marginal effect of explanatory variable on dependent variable in terms of probability. As the logistic model works on the assumption of maximum likelihood, the researcher preferred to interpret the parameters value using probability. The meanings of the coefficients of significant independent variables in this study are presented below.

Annual income

Richer people have more time than the poor have and thus can involve in PFM. Poor households do not benefit from common forest management as much as the rich can benefit and their participation in common resources management is minimal. The opportunity cost of poor households is also very high as the time spent for participation can be used to earn money through offering of their labour. As expected, total annual income has a significant positive relationship with participation at 10% significance level. Table 5.18 shows that an increase in household's annual income by one birr increases the possibility of household participation by 21%. This is inline with the findings of Shahbaz and Ali (2000).

Forest income

Forest income

In a similar fashion, the variable total forest income, which indicates the overall subsistence benefits from forests to households, is positively related and significant at the 5% level with participation. The results for this variable can be interpreted to mean that when households assess their community forest to be more useful for livelihoods, their probability to participate in PFM increases. Hence, a high level of forest dependency leads to greater participation in forest management.

More specifically, the coefficient for this variable can be interpreted to mean an increase in proportion of forest income to total income by 1% increases the possibility of household's participation by 83%. This is inline with findings of Behera and Engel (2006) from India, Argawal and Chhatre (2006) from the northern part of India and Gebremdhin (2008) from Ethiopia. The justification for this can be that, as a rational being, community has reason to preserve forests. Higher economic benefits from forests encourage the community to participate in the management of forest resources.

Hamlet

In general, in this study, hamlet is used as an indicator of other variables such as quality of forest and whether the household is native in the area. While running the regression *Hamlet 0* (Fasil) is taken as bases and used as a benchmark for comparison for other *hamlets*. The variable *hamlet2* (Befit), is significant at the 1% level. The interpretation for this variable is that the possibility of household's participation declines by 72% as respondents changes their residence from Fasil to Befit. The researcher anticipates that one possible reason why changing residence house from Befit to Fasil increases household participation is because their understanding about the aim of livelihood diversification programme is very low. Another reason could be the increase in respondent's forest income as we change their residence from Befit to Fasil.

On the other hand, the t score value corresponding to *hamlet1* (Hadha) is insignificant. The interpretation for this is that changing the residence of the respondent from Hadha to Fasil cannot increase the probability of household's participation in PFM. This is may be because households in Hadha generate more income from wild honey and coffee which in turn has a significant effect on participation.

Understanding about the aim of livelihood diversification programme

The logistic estimation also shows that understanding about the aim of livelihood diversification programme is statistically significant (at the 15% level) and has a positive effect on household decision to participate. Table 5.17 indicates that households who have understanding about the aim of the livelihood diversification programme are about 3.22 times more likely to participate than those who do not have understanding.

CHAPTER SIX: CONCLUSION AND POLICY IMPLICATION

6.1 Conclusion

World forests have been degrading at an alarming rate since agriculture began, 10,000 years ago (UN, 2005). The major cause for degradation of forests is human interference (such as expansion of agricultural land, grazing area, increase in population number etc). Participatory Forest Management has been adopted as an alternative approach since 1970s with the objective of reducing forest degradation on one hand and improving the living condition of the society in and around the forests on the other hand. The outcome from such a project has turned out to be a success in some countries (like Nepal) and failure in others like Bangladesh (Fisher, Prabhu and McDougall, 2007). Just like similar projects in the world, the Participatory Forest Management in Bale is established in 2006 with the objective of conserving the unique biodiversity of the region and improving livelihood of the community. The establishment process of Participatory Forest Management in Bale region varies greatly. The project in some sites has been established successfully while it is yet to be well established in others.

The discussion in the methodology part and the findings of this study have showed that the information the researcher had from FARM/SOS affirming that the project is a success in Dello and a failure in Goba contradicts with what is at the ground. This is because it was later found out that there is a great variation in adopting PFM within Dello itself. Thus, the researcher opted to make the comparison *hamlet* size instead of district wise. Two of the hamlets (Hadha and Befit) were taken from Dello and the other was taken from Goba (Fasil).

In an attempt to explain why the establishment of Participatory Forest Management is slow in some *hamlets* and relatively fast in others, this study identified some of the explanatory factors. The findings from this investigation are acceptable for the following reasons. First and foremost, the results of the study are in line with the works of prior researchers (Agrawal and Chhatre, 2006; Chhetri, 2005; and Gebremdhin, 2008). Second, the diversity of the data collection methods used enabled the grasping of enough information about the issue under investigation within the scope of the study.

The result from this study shows that about 87%, 80% and 26% of the respondents from Hadha, Fasil and Befit respectively have participated in PFM. Statistical tests, such as Pearson chi-square and two-sample t tests have showed that all economic and social variables have significant relationship with participation in PFM. *Hamlets* and distance from market from the biophysical factors show a significant relationship with participation. On the other hand, distance from forest has insignificant relationship with participation. The interpretation of this finding is that respondents' participation in PFM did not depend upon whether or not they reside close to the forest. This may be because respondents have realized the importance of forests in their livelihoods; hence, their willingness to participate does not depend on distance from forest.

The remaining explanatory variables, such as, quality of staff, traditional forest management system, quality of forest, demand for firewood in the nearby markets, expansion of agricultural land and livelihood diversification programme implemented so far, were analysed using data collected mainly from FARM/SOS and selected staff of Bale forest enterprise. The majority of the respondents said that these factors were determinating factors of PFM.

The relative importance of different factors on the decision of the community is still an ambiguous topic in literature of common resource management. Some writers argue that economic indicators are more important while others found that social indicators are the most important followed by economic indicators. Thus, there is little consensus on the relative importance and nature of association among the variables (Poteete and Ostrom, 2003). In this research, the logistic regression carried out using primary data collected from household survey found that economic variables have profound effect on household decisions to participate/ not to participate in PFM. Annual income from forests is significant at the 1% level. This shows that individual incentive to involve and contribute to the management of forest resources is determined by the economic value of forests. This is because, as a rational being, respondents are wiling to participate in PFM if the benefit generated from participation out weight the costs incurred. Similarly, total annual income is significant at the 10% level. The explanation for this can be that the richer segment of the society has more time to attend community meetings and have high understanding about PFM which in turn influences household decision to participate in PFM. Understanding about the aim of livelihood diversification programme was found to have significant effects on participation at the 15% level. Knowing that PFM has some economic

benefits (diversify their livelihood) by itself is a good incentive for the households to participate. The explanation for this is same with the explanation given above for annual income from forests. Again, the experience from Nepal joint forest management policy can also show this. As discussed in the literature review part, one of the major challenges of Nepal PFM was on how to diversify the livelihood of the community. This forced to the community forestry to redefine livelihood support.

The social factors, understanding/perception of the community about Community Based Organization and household size, were found to have insignificant effect on participation. From the biophysical factors, *hamlet2* (Befit), the place where the respondents reside, is found to have power in influencing household decision to participate in PFM at the 1% level. The explanation for this can be that the economic benefits from forests in Befit are minimal (as their participation in production of wild honey and/or forest coffee is minimal and income from firewood was nil). Another justification is that Befit community has relatively low understanding about PFM as they were not the main target group of the project. On the other hand, the variable *hamlet1* (Hadha) is insignificant. The interpretation for this is that changing respondent's residence from Hadha to Fasil could not result in the increase of the likelihood of household participation in PFM. This may be because Hadha respondents generate more income from forest than Fasil. Also, the understanding of Hadha respondents about the aim of livelihood diversification programme is statistically better than that of Fasil. Distance from forest and distant from market are insignificant in their power to influence household decision to participate.

6.2 Policy Implication

The livelihood diversification programme should include non-forest based livelihood diversification. This is because forest based livelihood diversification programme works well only for places where the forest is good in its natural stock (for example Dello). Including non-forest based livelihood diversification programme has dual benefits, especially for areas like Goba. First, it enables to carryout livelihood diversification programmes regardless of the quality of forest. The livelihood diversification in turn increases annual total income of the community, which in turn increases the probability of household participation. Second, the results from the logistic regression showed that understanding about the aim of livelihood diversification

programme has a profound effect on participation. Then if understanding about the aim can have such a great role, actual involvement in the livelihood diversification programme will have a greater role to play. Moreover, including the non- forest based livelihood diversification can also enable the programme to get acceptance from community like Befit (society who are new and cannot involve in the forest based livelihood diversification like coffee drying bed because they do not have coffee in the forest).

Although, the influence of understanding/ perception on household decision to participate in PFM is statistically insignificant, in all the surveyed *hamlets*, understanding/perception of the community about common forest resource management was very low (especially in Fasil and Befit). The possible reasons for this can be the following. First, in Fasil there is lack of regular follow up from project staff. Second, in Befit since the community was not native to the area they were not considered as a target group of the project. In one way or the other, the main reason for the low level of understanding about Community Based Organizations was related to the project staff. Thus, the project should take care of such mistakes while replicating the programme in other area.

Further research

This study has highlighted a number of issues that warrant further research in order to advance the forest resource management in the Bale region. The two key betterments that can be made to this research are increasing the scope of this study to include other factors and all stakeholders involved in the project. While analysing the findings of the previous researchers, Poteete and Ostrom (2003) and Agrwal (2001) confirmed the potential influence of many variables for the success of common resource management. Moreover, they suggested that, analysis which missed any of these variables, must at least discuss the biases that resulted from missing the variables. Thus, this research has a shortcoming for not analyzing all the 33 variables listed by Agrawal (see table 3.1 for detail explanation). Also, as successful participatory forest management results from good cooperation between the stakeholders of the project, the study will benefit from detail analysis of all the stakeholders involved in the project. Furthermore, in order to incorporate outstanding features of Bale and Oromia region the sample should include

villages from the remaining districts too. This can allow generalizing the findings from the study to the whole region.

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Appendices

Annex A: Household questionnaire

This is Alemtsehay. I am conducting a research on the project known as called Participatory forest management run by Farm/SOS in collaboration with Bale forest enterprise. The topic of my research is “*Determinating factors for successful establishment of participatory forest management (PFM): a comparative study of Goba and Dello Mena district, Ethiopia.*” Your information is very important for the study. So, I kindly request you to provide me with your answer. The information you provide me will be used only for academic purpose.

PART I: General Information

1. Name of the district: _____ village/sub village: _____
2. Sex: Male _____ Female _____. Age _____
3. Number of people live/economically dependent in the household: _____
4. Distance from market in hours: _____
5. Distance from forest hours: _____

PART II: Participation in PFM + understanding

1. Are you a member of the community forest management group?
1. Yes 2 No
 2. If no, why? _____
 3. If yes, how long it takes from learning to the date CBO is formulated? 1. Less than 2 years 2. 3 – 3 years 3. Not yet formed
 4. If your answer to the above question is not yet formed, why it takes long please specify

 5. How were you involved in the identification of forest user group?

 6. What are the major stages to formulate CBO?

- Was that satisfactory: Yes/No comments _____

7. How were by-laws set?
8. Who made these decisions?
9. Was the community consulted about the by-laws? 1. Yes 2.No 3. No idea
10. Were you involved in decisions making? 1. Yes 2. No

PART III: Economic benefits and PFM

1. What are the positive benefits of PFM?
2. What _____ are the economic losses of _____ PFM?
3. Do you understand the aim of Farm/SOS livelihood diversification programme? 1. Yes 2. No
4. If yes what are they? Please fill the following table

| No | Livelihood diversification programme | Answer |
|----|--------------------------------------|--------|
| 1 | Seeding (nursery) production/sell | |
| 2 | Eco-tourism | |
| 3 | Growing app tree | |
| 4 | Beekeeping | |
| 5 | Hand craft | |
| 6 | Seed collection and sell | |
| 7 | Production and sell of bamboo | |
| 8 | Coffee drying bed | |
| 9 | Saving and credit | |
| 10 | Others | |

5. Are you involved in any livelihood diversification activities? 1. Yes 2. No
6. If yes, what kind? _____. Where they good 1. Yes 2.No

PARTIV: Financial/ technical support

1. Have you received any financial/ technical support from Farm/SOS in group and or individually 1.Yes 2.No
2. If yes, for what purpose have you received the grant? _____.
3. Is there any follow up by Farm/SOS or others (women’s and children affaires office, cooperative promotion office, pastoralist development office) after you have received the grant? 1.Yes 2.No
4. If yes, how frequent has these organizations visited you to check progress of activity? _____. Was that enough? 1. Yes 2.No

PARTV: household activities and their contribution to income

1. Main household activities and their contribution

| No | Activity | Tick | Total income |
|----|-----------------|------|--------------|
| 1 | Crop production | | |
| | Teff | | |
| | Sorghum | | |
| | Maize | | |
| | Barely | | |
| | Potato | | |
| | Onion | | |
| | Garlic | | |

| | | | |
|---|----------------------------------|--|--|
| | Others | | |
| 2 | Animal production | | |
| 3 | Forest related activity | | |
| 4 | Labor excluding on your own land | | |
| 5 | Petty trade | | |
| 6 | Remittance | | |
| 7 | Others | | |

2. Annual income from forest products

| Product | Tick | Units | Total Income |
|-----------------|------|-------|--------------|
| Firewood | | | |
| Coffee | | | |
| Honey | | | |
| Fruit/nuts | | | |
| Grass | | | |
| Medical plant | | | |
| Others(specify) | | | |

3. If you tick firewood, why you sell firewood? Please fill the following table

| No | Why you sell firewood | Answer | |
|----|--|--------|----|
| | | Yes | No |
| 1 | No surplus produced to generate cash income | | |
| 2 | Income from the other source is not enough to cover my expenditure | | |
| 3 | It is just a trend of the society (culture) | | |
| 4 | Sell of firewood is an additional source of income | | |
| 5 | The product has high demand in the market | | |
| 6 | Open forest resource access | | |
| 7 | Others(specify) | | |

4. what are the advantage of selling firewood

5. What are the advantages of selling firewood?

PARTVI: services provided by the forest management group

1. What PFM information did you get from Farm/SOS?

| Type of assistance | Answer | | How relevant is the training | | |
|--|--------|----|------------------------------|---|---|
| | Yes | No | 1 | 2 | 3 |
| Resource assessment | | | | | |
| Protection, development and utilization of forest resource | | | | | |
| Development of business plan | | | | | |
| Livelihood diversification | | | | | |

Code: relevance: 1= not relevant, 2= quite relevant, 3= very relevant

PARTVII: Information related to transaction cost

1. How many times in a year is the forest management planning team meeting held? _____.
2. How much time do you devote throughout the year? _____.
3. How many times do you travel to district headquarter in context of forest management?
_____.
4. How much time do you devote throughout the year? _____.
5. How much is your investment in PFM so far? _____.

Thank you very much for time!

Annex B: Interview with project and Bale forest enterprise staff

This is Alemtsehay. I am conducting a research on the project known as called Participatory forest management run by Farm/SOS in collaboration with Bale forest enterprise. The topic of my research is “*Determinating factors for successful establishment of participatory forest management (PFM): a comparative study of Goba and Dello Mena district, Ethiopia.*” Your information is very important for the study. So, I kindly request you to provide me with your answer. The information you provide me will be used only for academic purpose.

1. What do you think very relevant in your staff to establish PFM?

2. How do you rate the performance of your staff in Goba and Dello especially in performing these duties and responsibilities?

3. Has this difference resulted in the slow establishment of PFM in Goba and fast in Dello? 1.

Yes 2. No

4. What has been the contribution of the traditional forest management system in Dello which have almost the same sprit with PFM for the faster take-up of the project?

5. Who are the stakeholders of the project (PFM) in Dello and Goba?

6. What are the roles of each stakeholder in the two districts? Is there any difference?

-
-
7. Has this contribute to the slow establishment of PFM in Goba and fast in Dello? 1 yes 2. No
8. Is there any difference in quality (in terms of providing livelihood support) of forest between the two districts? 1 Yes 2 No
9. If yes, what is the difference and impacts it has on the implementation of PFM?
-
-

10. Is there any difference between the two districts that affects PFM uptake due to nearby markets or towns? 1. Yes 2 No

11. If yes, has this contribute to the slow establishment of PFM in Goba and fast in Dello? 1 Yes 2 No

12. Has there any difference between the two districts in terms of expansion of agricultural land? 1. Yes 2. No

13. If yes, has this contribute to the slow establishment of PFM in Goba and fast in Dello? 1 Yes 2 No

14. What livelihood diversification activities are implemented to lessen the pressure on the forest?

15 Has there any difference in livelihood diversification activities performed in Dello and Goba? 1. Yes 2. No

16 If yes, has this contribute to the relatively fast establishment of PFM in Dello and slow in Goba? 1. Yes 2 No
Explain how,

17. Are there alternative income source introduced to replace extraction of forest products? 1. Yes 2. No

If yes, please specify _____

18. What components are important to adopt PFM?

1. Economic benefit from the forest
2. Quality of forest
3. Economic status of the community
4. Other; please specify _____

19. What would you do differently if PFM programme was to be undertaken again?

Thank you very much for your time!

Annex C: Focus group discussion

Focus group discussion

1. What has been done by Farm/SOS to formulate cooperatives other than forest cooperatives to support livelihood of the community? Was that enough? And was the livelihood diversification programme performed so far successful? What impacts it has on establishment of PFM?
2. Have you faced any problem in the past due to forest related policy or any other policy? Do you think that the problem will appear again if you adopt PFM? Have you thought it as a factor when adopting PFM?
3. Do you have a fear that PFM will restrict your use rights (such as firewood sell, honey production timber etc) of forest? Why do you think this?
4. Any other suggestion about the forest management, management committee of the forest group and PFM in general?

Annex D: Photos



Photo: Fire set by farmers in 2002 in Goba district for expansion of agricultural land. Source: Farm/SOS



Photo: Natural forest of Bale region: Rira, a place found in Goba district, taken during data collection

Annex E: Two-sample t tests and chi-square tests results for descriptive analysis

Table.1:ttest totali, by (hamlet)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------------------------------|-----|------------------------|-----------|--------------------|----------------------|----------|
| Fasil | 30 | 18191.67 | 1841.721 | 10087.52 | 14424.92 | 21958.41 |
| Hadha | 31 | 27326.13 | 5224.725 | 29090.04 | 16655.82 | 37996.44 |
| combined | 61 | 22833.77 | 2844.321 | 22214.85 | 17144.28 | 28523.26 |
| diff | | -9134.462 | 5612.821 | | -20365.69 | 2096.767 |
| diff = mean(Fasil) - mean(Hadha) | | | | | t = | -1.6274 |
| Ho: diff = 0 | | | | | degrees of freedom = | 59 |
| Ha: diff < 0 | | Ha: diff != 0 | | Ha: diff > 0 | | |
| Pr(T < t) = 0.0545 | | Pr(T > t) = 0.1090 | | Pr(T > t) = 0.9455 | | |

Table.2:ttest totali, by (hamlet)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------------------------------|-----|------------------------|-----------|--------------------|----------------------|----------|
| Hadha | 31 | 27326.13 | 5224.725 | 29090.04 | 16655.82 | 37996.44 |
| Befit | 19 | 15259.21 | 4951.74 | 21584.14 | 4855.99 | 25662.43 |
| combined | 50 | 22740.7 | 3805.9 | 26911.78 | 15092.46 | 30388.94 |
| diff | | 12066.92 | 7728.396 | | -3472.062 | 27605.9 |
| diff = mean(Hadha) - mean(Befit) | | | | | t = | 1.5614 |
| Ho: diff = 0 | | | | | degrees of freedom = | 48 |
| Ha: diff < 0 | | Ha: diff != 0 | | Ha: diff > 0 | | |
| Pr(T < t) = 0.9375 | | Pr(T > t) = 0.1250 | | Pr(T > t) = 0.0625 | | |

Table.3:ttest totali , by (participation)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|-----------------------------|-----|-----------|-----------|-----------|----------------------|-----------|
| no | 24 | 11924.79 | 1813.804 | 8885.789 | 8172.652 | 15676.93 |
| yes | 56 | 24939.11 | 3330.568 | 24923.69 | 18264.5 | 31613.71 |
| combined | 80 | 21034.81 | 2478.609 | 22169.35 | 16101.26 | 25968.36 |
| diff | | -13014.32 | 5240.076 | | -23446.51 | -2582.126 |
| diff = mean(no) - mean(yes) | | | | | t = | -2.4836 |
| Ho: diff = 0 | | | | | degrees of freedom = | 78 |

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0076 Pr(|T| > |t|) = 0.0152 Pr(T > t) = 0.9924

Table.4:ttest forest_income, by (hamlet)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------------------------------|-----|-----------|-----------|-----------|----------------------|----------|
| Fasil | 30 | .2132 | .0397678 | .2178175 | .1318656 | .2945344 |
| Hadha | 31 | .3829903 | .0289168 | .1610018 | .3239344 | .4420462 |
| combined | 61 | .2994869 | .0266174 | .2078884 | .2462442 | .3527296 |
| diff | | -.1697903 | .0489298 | | -.2676986 | -.071882 |
| diff = mean(Fasil) - mean(Hadha) | | | | | t = | -3.4701 |
| Ho: diff = 0 | | | | | degrees of freedom = | 59 |

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0005 Pr(|T| > |t|) = 0.0010 Pr(T > t) = 0.9995

Table.5:ttest forest_income, by (hamlet)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------------------------------|-----|----------|-----------|-----------|----------------------|----------|
| Hadha | 31 | .3829903 | .0289168 | .1610018 | .3239344 | .4420462 |
| Befit | 19 | .0690526 | .0287389 | .1252701 | .0086744 | .1294309 |
| combined | 50 | .263694 | .0301094 | .2129057 | .2031869 | .3242011 |
| diff | | .3139377 | .0432995 | | .2268782 | .4009972 |
| diff = mean(Hadha) - mean(Befit) | | | | | t = | 7.2504 |
| Ho: diff = 0 | | | | | degrees of freedom = | 48 |

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

Table.6:ttest forest_incom, by (participation)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|-----------------------------|-----|-----------|-----------|-----------|----------------------|-----------|
| no | 24 | 1566.667 | 586.245 | 2872.002 | 353.9265 | 2779.407 |
| yes | 56 | 6414.821 | 922.8113 | 6905.688 | 4565.466 | 8264.177 |
| combined | 80 | 4960.375 | 712.3969 | 6371.872 | 3542.384 | 6378.366 |
| diff | | -4848.155 | 1465.044 | | -7764.833 | -1931.476 |
| diff = mean(no) - mean(yes) | | | | | t = | -3.3092 |

Ho: diff = 0 degrees of freedom = 78
 Ha: diff < 0 Pr(T < t) = 0.0007
 Ha: diff != 0 Pr(|T| > |t|) = 0.0014
 Ha: diff > 0 Pr(T > t) = 0.9993

Table.7:ttest I_firewoodsales, by (participation)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------|-----|-----------|-----------|-----------|----------------------|----------|
| no | 24 | 556.25 | 291.3032 | 1427.088 | -46.35653 | 1158.857 |
| yes | 56 | 1290.536 | 285.9863 | 2140.125 | 717.4064 | 1863.665 |
| combined | 80 | 1070.25 | 220.689 | 1973.902 | 630.9795 | 1509.52 |
| diff | | -734.2857 | 477.4756 | | -1684.867 | 216.2952 |

diff = mean(no) - mean(yes) t = -1.5378
 Ho: diff = 0 degrees of freedom = 78

Ha: diff < 0 Pr(T < t) = 0.0641
 Ha: diff != 0 Pr(|T| > |t|) = 0.1281
 Ha: diff > 0 Pr(T > t) = 0.9359

Table.8:ttest coffeei, by (hamlet)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------|-----|-----------|-----------|-----------|----------------------|-----------|
| Fasil | 30 | 266.6667 | 208.6262 | 1142.693 | -160.0219 | 693.3552 |
| Hadha | 31 | 6236.29 | 1032.421 | 5748.275 | 4127.806 | 8344.774 |
| combined | 61 | 3300.41 | 655.4637 | 5119.335 | 1989.287 | 4611.532 |
| diff | | -5969.624 | 1069.636 | | -8109.96 | -3829.287 |

diff = mean(Fasil) - mean(Hadha) t = -5.5810
 Ho: diff = 0 degrees of freedom = 59

Ha: diff < 0 Pr(T < t) = 0.0000
 Ha: diff != 0 Pr(|T| > |t|) = 0.0000
 Ha: diff > 0 Pr(T > t) = 1.0000

Table.9:ttest coffeei, by (hamlet)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------|-----|---------|-----------|-----------|----------------------|----------|
| Hadha | 31 | 6236.29 | 1032.421 | 5748.275 | 4127.806 | 8344.774 |
| Befit | 19 | 1000 | 510.9903 | 2227.355 | -73.55083 | 2073.551 |
| combined | 50 | 4246.5 | 756.8928 | 5352.04 | 2725.467 | 5767.533 |
| diff | | 5236.29 | 1382.405 | | 2456.78 | 8015.801 |

```

diff = mean(Hadha) - mean(Befit)                                t = 3.7878
Ho: diff = 0                                                    degrees of freedom = 48

Ha: diff < 0                                                    Ha: diff != 0                                                    Ha: diff > 0
Pr(T < t) = 0.9998                                              Pr(|T| > |t|) = 0.0004                                          Pr(T > t) = 0.0002

```

Table.10:ttest coffeei, by (participation)

Two-sample t test with equal variances

```

-----
Group |      Obs      Mean   Std. Err.   Std. Dev.   [95% Conf. Interval]
-----+-----
no    |         24   851.0417   455.6571   2232.255   -91.5568    1793.64
yes   |         56  3569.643   697.7814   5221.718   2171.258   4968.028
-----+-----
combined |         80  2754.063   524.4681   4690.985   1710.135   3797.99
-----+-----
diff  |              -2718.601   1109.901              -4928.245   -508.9576
-----
diff = mean(no) - mean(yes)                                t = -2.4494
Ho: diff = 0                                                degrees of freedom = 78

Ha: diff < 0                                                    Ha: diff != 0                                                    Ha: diff > 0
Pr(T < t) = 0.0083                                              Pr(|T| > |t|) = 0.0166                                          Pr(T > t) = 0.9917

```

Table.11:ttest livestchockt , by (hamlet)

Two-sample t test with equal variances

```

-----
Group |      Obs      Mean   Std. Err.   Std. Dev.   [95% Conf. Interval]
-----+-----
Fasil |         30  3181.333   705.3972   3863.62    1738.634   4624.033
Hadha |         31  2283.871   1032.297   5747.585   175.6398   4392.102
-----+-----
combined |         61  2725.246   626.4264   4892.547   1472.207   3978.285
-----+-----
diff  |              897.4624   1258.182              -1620.154   3415.079
-----
diff = mean(Fasil) - mean(Hadha)                            t = 0.7133
Ho: diff = 0                                                degrees of freedom = 59

Ha: diff < 0                                                    Ha: diff != 0                                                    Ha: diff > 0
Pr(T < t) = 0.7608                                              Pr(|T| > |t|) = 0.4785                                          Pr(T > t) = 0.2392

```

Table.12:ttest livestchockt, by (hamlet)

Two-sample t test with equal variances

```

-----
Group |      Obs      Mean   Std. Err.   Std. Dev.   [95% Conf. Interval]
-----+-----
Hadha |         31  2283.871   1032.297   5747.585   175.6398   4392.102
Befit |         19           0           0           0           0           0
-----+-----
combined |         50   1416   655.4286   4634.58    98.86697   2733.133
-----+-----
diff  |              2283.871   1323.893              -377.9935   4945.735
-----

```

```

diff = mean(Hadha) - mean(Befit)
Ho: diff = 0
Ha: diff < 0
Pr(T < t) = 0.9545

t = 1.7251
degrees of freedom = 48
Ha: diff != 0
Pr(|T| > |t|) = 0.0909
Ha: diff > 0
Pr(T > t) = 0.0455

```

Table.13:ttest livestchockt, by (participation)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------|-----|-----------|-----------|-----------|----------------------|----------|
| no | 24 | 662.5 | 359.3378 | 1760.388 | -80.84684 | 1405.847 |
| yes | 56 | 2684.643 | 675.1254 | 5052.176 | 1331.661 | 4037.624 |
| combined | 80 | 2078 | 494.242 | 4420.635 | 1094.236 | 3061.764 |
| diff | | -2022.143 | 1060.992 | | -4134.416 | 90.13002 |

```

diff = mean(no) - mean(yes)
Ho: diff = 0
Ha: diff < 0
Pr(T < t) = 0.0302

t = -1.9059
degrees of freedom = 78
Ha: diff != 0
Pr(|T| > |t|) = 0.0603
Ha: diff > 0
Pr(T > t) = 0.9698

```

Table.14:tab under_aims participation, chi2

| under_aims | participation | | Total |
|------------|---------------|-----|-------|
| | no | yes | |
| no | 17 | 23 | 40 |
| yes | 7 | 33 | 40 |
| Total | 24 | 56 | 80 |

Pearson chi2(1) = 5.9524 Pr = 0.015

Table.15:tab financ_sopprt hamlet, chi2

| financ_sopprt | hamlet | | | Total |
|---------------|--------|----|----|-------|
| | 0 | 1 | 2 | |
| no | 30 | 29 | 19 | 78 |
| yes | 0 | 2 | 0 | 2 |
| Total | 30 | 31 | 19 | 80 |

Pearson chi2(2) = 3.2423 Pr = 0.198

Table.16:tab under_aims hamlet, chi2

| under_aims | hamlet | | Total |
|------------|--------|-------|-------|
| | Hadha | Befit | |
| no | 9 | 11 | 20 |
| yes | 22 | 8 | 30 |
| Total | 31 | 19 | 50 |

Pearson chi2(1) = 4.0889 Pr = 0.043

Table.17:tab under_aims hamlet, chi2

| under_aims | hamlet | | Total |
|------------|--------|-------|-------|
| | Fasil | Hadha | |
| no | 20 | 9 | 29 |
| yes | 10 | 22 | 32 |
| Total | 30 | 31 | 61 |

Pearson chi2(1) = 8.6583 Pr = 0.003

Table.18:tab under_aims participation, chi2

| under_aims | participation | | Total |
|------------|---------------|-----|-------|
| | no | yes | |
| no | 17 | 23 | 40 |
| yes | 7 | 33 | 40 |
| Total | 24 | 56 | 80 |

Pearson chi2(1) = 5.9524 Pr = 0.015

Table.19: tab hamlet under_aims, chi2

| Hamlet | under_aims | | Total |
|--------|------------|-----|-------|
| | no | yes | |
| Hadha | 9 | 22 | 31 |
| Befit | 11 | 8 | 19 |
| Total | 20 | 30 | 50 |

Pearson chi2(1) = 4.0889 Pr = 0.043

Table.20:tab hamlet under_aims, chi2

| hamlet | under_aims | | Total |
|--------|------------|-----|-------|
| | no | yes | |
| Fasil | 20 | 10 | 30 |
| Hadha | 9 | 22 | 31 |
| Total | 29 | 32 | 61 |

Pearson chi2(1) = 8.6583 Pr = 0.003

Table.21:tab district under_aims, chi2

| district | under_aims | | Total |
|----------|------------|-----|-------|
| | no | yes | |
| Hadha | 9 | 22 | 31 |
| Befit | 11 | 8 | 19 |
| Total | 20 | 30 | 50 |

Pearson chi2(1) = 4.0889 Pr = 0.043

Table.22:tab financ_sopprt participation, chi2

| financ_sopprt | participation | | Total |
|---------------|---------------|-----|-------|
| | no | yes | |
| no | 24 | 54 | 78 |
| yes | 0 | 2 | 2 |
| Total | 24 | 56 | 80 |

Pearson chi2(1) = 0.8791 Pr = 0.348

Table.23:tab understand hamlet, chi2

| understand | hamlet | | Total |
|------------|--------|-------|-------|
| | Hadha | Befit | |
| no | 20 | 18 | 38 |
| yes | 11 | 1 | 12 |
| Total | 31 | 19 | 50 |

Pearson chi2(1) = 5.8983 Pr = 0.015

Table.24:tab understand hamlet, chi2

| understand | hamlet | | Total |
|------------|--------|-------|-------|
| | Fasil | Hadha | |
| no | 25 | 20 | 45 |
| yes | 5 | 11 | 16 |
| Total | 30 | 31 | 61 |

Pearson chi2(1) = 2.7899 Pr = 0.095

Table.25:tab understand participation, chi2

| understand | participation | | Total |
|------------|---------------|-----|-------|
| | no | yes | |
| no | 23 | 40 | 63 |
| yes | 1 | 16 | 17 |
| Total | 24 | 56 | 80 |

Pearson chi2(1) = 5.9793 Pr = 0.014

Table 26 ttest hysize, by (hamlet)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------|-----|-----------|-----------|-----------|----------------------|----------|
| Fasil | 30 | 6.8 | .6439819 | 3.527234 | 5.482909 | 8.117091 |
| Hadha | 31 | 8.354839 | .717745 | 3.996235 | 6.889008 | 9.820669 |
| combined | 61 | 7.590164 | .4894388 | 3.822639 | 6.611141 | 8.569187 |
| diff | | -1.554839 | .9662965 | | -3.488393 | .3787161 |

diff = mean(Fasil) - mean(Hadha) t = -1.6091
 Ho: diff = 0 degrees of freedom = 59

Ha: diff < 0 Pr(T < t) = 0.0565
 Ha: diff != 0 Pr(|T| > |t|) = 0.1129
 Ha: diff > 0 Pr(T > t) = 0.9435

Table.30:tab hamlet participation, chi2

| hamlet | participation | | Total |
|--------|---------------|-----|-------|
| | no | yes | |
| Fasil | 6 | 24 | 30 |
| Hadha | 4 | 27 | 31 |
| Total | 10 | 51 | 61 |

Pearson chi2(1) = 0.5602 Pr = 0.454

Table.31:ttest dist_forest, by (participation)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------|-----|----------|-----------|-----------|----------------------|----------|
| no | 24 | 58.33333 | 5.235977 | 25.65095 | 47.50189 | 69.16478 |
| yes | 56 | 54.01786 | 7.12871 | 53.34638 | 39.7316 | 68.30411 |
| combined | 80 | 55.3125 | 5.21632 | 46.65619 | 44.92967 | 65.69533 |
| diff | | 4.315476 | 11.44525 | | -18.47027 | 27.10123 |

diff = mean(no) - mean(yes) t = 0.3771
 Ho: diff = 0 degrees of freedom = 78

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
 Pr(T < t) = 0.6464 Pr(|T| > |t|) = 0.7072 Pr(T > t) = 0.3536

Table.32: ttest dist_market, by (participation)

Two-sample t test with equal variances

| Group | Obs | Mean | Std. Err. | Std. Dev. | [95% Conf. Interval] | |
|----------|-----|-----------|-----------|-----------|----------------------|----------|
| no | 24 | 61.25 | 8.561637 | 41.94328 | 43.5389 | 78.9611 |
| yes | 56 | 76.60714 | 4.269925 | 31.95319 | 68.05002 | 85.16426 |
| combined | 80 | 72 | 3.989305 | 35.68143 | 64.05949 | 79.94051 |
| diff | | -15.35714 | 8.586709 | | -32.45197 | 1.737682 |

diff = mean(no) - mean(yes) t = -1.7885
 Ho: diff = 0 degrees of freedom = 78

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
 Pr(T < t) = 0.0388 Pr(|T| > |t|) = 0.0776 Pr(T > t) = 0.9612

Annex E: Logistic estimates for determinating factors of PFM

Table.33: logistic participation under_aims understand
 forestincome3 lntotali hamlet2 hamlet11 lnhhsize lndist_market
 distan
 > ce_forest I_firewoodsales age

```

Logistic regression                               Number of obs   =           80
                                                  LR chi2(11)    =           44.27
                                                  Prob > chi2    =           0.0000
Log likelihood = -26.734415                    Pseudo R2      =           0.4529
  
```

| Participation | Odds Ratio | Std. Err. | z | P> z | [95% Conf. Interval] | |
|---------------|------------|-----------|-------|-------|----------------------|----------|
| under_aims | 3.229315 | 2.749047 | 1.38 | 0.168 | .6088366 | 17.12853 |
| understand | .8166627 | 1.131782 | -0.15 | 0.884 | .0540001 | 12.35069 |
| forestinco~3 | 165.2138 | 339.7785 | 2.48 | 0.013 | 2.934037 | 9303.082 |
| lntotali | 3.631624 | 2.43024 | 1.93 | 0.054 | .9783332 | 13.48078 |
| hamlet2 | .0232046 | .0432946 | -2.02 | 0.044 | .000599 | .898925 |
| hamlet1 | .0989201 | .1607797 | -1.42 | 0.155 | .0040906 | 2.392129 |
| lnhhsize | 2.254095 | 1.631431 | 1.12 | 0.261 | .5456369 | 9.311948 |
| lndist_mar~t | .2107769 | .2576303 | -1.27 | 0.203 | .0192047 | 2.313328 |
| distance_f~t | .9804743 | .1182712 | -0.16 | 0.870 | .7740317 | 1.241977 |
| I_firewood~s | .9996939 | .0003105 | -0.99 | 0.324 | .9990856 | 1.000303 |
| age | 1.019614 | .0327631 | 0.60 | 0.546 | .9573794 | 1.085893 |

Table.34 :logistic participation under_aims understand
 forestincome3 lntotali hamlet2 hamlet11 lnhhsize lndist_market
 distan
 > ce_forest I_firewoodsales age,r

```

Logistic regression                               Number of obs   =           80
                                                  Wald chi2(11)  =           40.28
                                                  Prob > chi2    =           0.0000
Log pseudolikelihood = -26.734415            Pseudo R2      =           0.4529
  
```

| Participatiion | Odds Ratio | Robust Std. Err. | z | P> z | [95% Conf. Interval] | |
|----------------|------------|------------------|-------|-------|----------------------|----------|
| under_aims | 3.229315 | 2.344604 | 1.61 | 0.106 | .7782267 | 13.40031 |
| understand | .8166627 | .8708967 | -0.19 | 0.849 | .1009982 | 6.603466 |
| forestinco~3 | 165.2138 | 407.7518 | 2.07 | 0.039 | 1.309963 | 20836.92 |
| lntotali | 3.631624 | 2.68599 | 1.74 | 0.081 | .8522024 | 15.47601 |
| hamlet2 | .0232046 | .0494572 | -1.77 | 0.077 | .0003559 | 1.512815 |
| hamlet1 | .0989201 | .2006355 | -1.14 | 0.254 | .0018571 | 5.269161 |
| lnhhsize | 2.254095 | 1.497805 | 1.22 | 0.221 | .6128643 | 8.290486 |
| lndist_mar~t | .2107769 | .3281214 | -1.00 | 0.317 | .009971 | 4.455629 |
| distance_f~t | .9804743 | .0951382 | -0.20 | 0.839 | .8106656 | 1.185853 |
| I_firewood~s | .9996939 | .0003265 | -0.94 | 0.349 | .9990542 | 1.000334 |
| age | 1.019614 | .0317609 | 0.62 | 0.533 | .9592255 | 1.083803 |

Table.35: mfx

Marginal effects after logistic
 y = Pr(participation) (predict)
 = .79399944

| variable | dy/dx | Std. Err. | z | P> z | [| 95% C.I. |] | X |
|-----------|-----------|-----------|-------|-------|----------|----------|---|---------|
| under_~s* | .1918196 | .13295 | 1.44 | 0.149 | -.068758 | .452397 | | .5 |
| unders~d* | -.0342602 | .18497 | -0.19 | 0.853 | -.396799 | .328279 | | .2125 |
| forest~3 | .8353623 | .40088 | 2.08 | 0.037 | .049661 | 1.62106 | | .411521 |
| lntotali | .2109456 | .10569 | 2.00 | 0.046 | .003789 | .418102 | | 9.6463 |
| hamlet2* | -.7246422 | .28133 | -2.58 | 0.010 | -1.27604 | -.173244 | | .2375 |
| hamlet1* | -.4212143 | .37207 | -1.13 | 0.258 | -1.15047 | .308037 | | .3875 |
| lnhhsz | .1329366 | .11159 | 1.19 | 0.234 | -.085783 | .351656 | | 1.82704 |
| lndist~t | -.2546623 | .24379 | -1.04 | 0.296 | -.73249 | .223165 | | 4.15957 |
| distan~t | -.0032253 | .0159 | -0.20 | 0.839 | -.034383 | .027932 | | 6.65296 |
| I_fire~s | -.0000501 | .00005 | -0.94 | 0.347 | -.000154 | .000054 | | 1070.25 |
| age | .003177 | .0051 | 0.62 | 0.533 | -.006816 | .01317 | | 38.95 |

(*) dy/dx is for discrete change of dummy variable from 0 to 1