AN ABSTRACT OF THE THESIS OF

Dinesh Timilsina for the degree of Master of Public Policy presented on March 17, 2015


Abstract approved: ____________________________________________________

Prof. Todd Pugatch

This study examines the association of household characteristics with forest product consumption and other benefits derived from community forest in Nepal. The analysis is based on random sample data of 80 households from a Community Forest User Groups of Baghmara Community Forestry (BCF) in Nepal. Using an OLS regression to examine the impact of household determinants over the consumption of subsistence resources like firewood, grass and timber. We find that geophysical variable distance has negatively significant association with consumption of natural resources. Likewise, socio-economic variables: household size, wealth, participation, caste and household income have also a significant correlation with consumption of at least few of natural resources. Moreover, a second OLS regression was conducted to explore the correlation between household attributes and other benefits from BCF like financial assistance for toilet construction, assistance for child education and training programs. The result showed significant correlation of distance and some socio-economic attributes with those benefits. Based on this analysis, it can be inferred that upper caste, wealthier, nearby and bigger family size households get more benefits in term of both resources and assistance in comparison to lower caste, less wealthier, distant and smaller households, in contrast with the stated resource distribution mechanism in the institutional arrangement of the community forestry program. Thus, the study emphasized on more inclusive and participatory management approach; compensatory transfer schemes; transferable property rights over forest products as the policy implications to ensure efficient and equitable distribution of resources and benefits.
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By
Dinesh Timilsina

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Master of Public Policy Essay of Dinesh Timilsina presented on March 17, 2015

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Dinesh Timilsina, Author
Forest is not about trees, it is about people. And it is about trees only insofar as trees can serve the needs of people (Westoby, 1987:ix)
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<th>Description</th>
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<tbody>
<tr>
<td>BCF</td>
<td>Baghmara Community Forest</td>
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<tr>
<td>BISEP-ST</td>
<td>Biodiversity sector program for Siwaliks and Terai</td>
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<td>CARE</td>
<td>Cooperative for Assistance and Relief Everywhere</td>
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<td>CF</td>
<td>Community Forestry</td>
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<td>CFP</td>
<td>Community Forestry Program</td>
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<td>CFUC</td>
<td>Community Forest User Committee</td>
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<td>CFUG</td>
<td>Community Forest User Group</td>
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<td>CFUGs</td>
<td>Community Forest User Groups</td>
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<td>CNP</td>
<td>Chitwan National Park</td>
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<td>CPRs</td>
<td>Common Pool Resources</td>
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<tr>
<td>DANIDA</td>
<td>Danish International Development Agency</td>
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<td>DFO</td>
<td>District Forest Office</td>
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<tr>
<td>DOF</td>
<td>Department of Forest</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<tr>
<td>FECOFUN</td>
<td>Federation of community forestry users of Nepal</td>
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<td>FUG</td>
<td>Forest User Group</td>
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<td>GoN</td>
<td>Government of Nepal</td>
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<td>HH</td>
<td>Household</td>
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<td>HHs</td>
<td>Households</td>
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<tr>
<td>ICIMOD</td>
<td>International Centre for Integrated Mountain Development (Nepal)</td>
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<td>INGOs</td>
<td>International Non Governmental Organizations</td>
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<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
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<td>LFP</td>
<td>Livelihood Forestry Program</td>
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<tr>
<td>MFSC</td>
<td>Ministry of Forest and Soil Conservation</td>
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<td>NGOs</td>
<td>Non Governmental Organizations</td>
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<td>NTFP</td>
<td>Non Timber Forest Product</td>
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<td>NTFPs</td>
<td>Non Timber Forest Products</td>
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<tr>
<td>OP</td>
<td>Operational Plan</td>
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<td>UG</td>
<td>User Group</td>
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<td>VDC</td>
<td>Village Development Committee</td>
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1. INTRODUCTION:

There is a general consensus among scholars and policy-makers that the majority of rural households in developing countries rely heavily on the natural environment for their livelihoods. Nepal, being one of the least developed countries, has a large number of households that depend upon common pool resources (CPRs) such as forests to meet their daily economic, social and spiritual needs (Kerapeletswe & Lovett, 2001). The extensive usage and dependence of rural households on CPRs has made the environment critically vulnerable (Beyene, 2011). Moreover, with increased demands of a growing population and open access to CPRs, the vital resources were depleting, degrading and, no longer meeting the basic livelihood needs of the locals. Despite the fact of increasing environmental degradation, it was realized that the local communities who depend most on natural resources for their livelihoods, not only understand their problem properly, but also have indigenous knowledge and greater incentives to manage their environment sustainably over time (KC et al., 2014; Adhikari, 2002). Also, Berkes (1989) emphasized the role of community-based institutions in the management of CPRs. Thus, the Community Forestry Program (CFP) was introduced in late 1970’s as the most viable approach for natural resource management (Nurse & Malla, 2005; Tole, 2010).

As policy diffusion, CFP is now being adopted all over the world. However, the Government of Nepal (GoN) initiated the program in 1978, and it is considered to be a pioneer nation to move towards locally based systems of forest governance and established decentralized forest policy regimes in the world (Agrawal, 2005; Poudel & Chou, 2011; Pandit & Bevilacqua, 2011). Section 6 of the Forest Act of Nepal 1993 defined Community Forestry (CF) as a part of national forest handed over to a user group for the conservation,
development, management, and proper utilization of forest resources to fulfill their basic needs. The program implicates devolution of management rights from centralized government to local user group however, the landownership remains within the government. CF incorporates a well-defined legal and regulatory framework, participatory institutions, benefit-sharing mechanisms and biodiversity conservation strategies (Ojha et al., 2009).

In general, CF is now the core impetus in Nepal’s forestry sector policy (Joshi & Pokharel, 1998). The Department of Forestry DOF (2011) reports that approximately a quarter of Nepal’s forestland (i.e. 1.66 million hectares of national forests) has been handed over to 17,937 community forest user groups, consisting of 2.2 million households (HH). The program aims at forest management and biodiversity conservation through participatory approach, and poverty reduction through fulfillment of subsistence needs of the Community Forest User Groups.

The Community Forestry User Group (CFUG) is the key stakeholder in this program. They are given the legal authority to take management decisions and form operational-plan for equitable distribution of resources (Acharya, 2002). CFUG is comprised of all households (HHs) living adjacent to the forest. HHs may differ along a wide range of dimensions including their sociocultural backgrounds, economic status, and geophysical attributes (Baland & Platteau, 1998). CFP is an institutional approach for sharing the benefits of forest among members of CFUG. Timber, firewood, grass, leaf litter, animal bedding, fruits, agricultural implements are the basic livelihood resources provided by the community forest.

Households have different interests and diverse preferences for resources along with their socio-economic heterogeneity (Malla et al., 2003). In general, better-off HHs prefers valuable products such as timber whereas; poorer HHs relies on the forest for subsistence
resources like firewood and grass. In addition, dominant HHs influence the entire institutional arrangements of the CF. Predominantly, socio-economically active HHs influence the decision making process and receive more benefits from the program compared to marginalized HHs (Dhakal et al., 2007) leading to inconsistency in resource distribution.

In this context, this study has conducted an empirical investigation to examine the correlation of household’s attributes and their resource consumption. Furthermore, the study has reviewed the institutional arrangements of the proposed CF: Baghmara Community Forest (BCF). The result shows that geophysical attribute (distance of Household) has negatively significant association with natural resource and economic-benefit consumption. Other socio-economic attributes like household income, size, wealth and caste also, have positively significant correlation with resource consumption and benefit-sharing. Meaning, there is no equal distribution of resources and benefits as stated in resource distribution mechanism in the institutional arrangement of the CFP. In order to solve the existing disparity, effective policy and institutional interventions are recommended.

However, this study contributes to the limited literature related to the Community Forest program in Nepal, specifically at Baghmara Community Forest. It is the pioneer research particularly at BCF examining the relationship between CFUG’s attributes and their resource consumption pattern. In addition, this study includes economic benefits variables and examines its association with CFUG’s attributes, which has not been done before.

The entire paper is organized as follows. The next section describes the importance and statement of problems. It is followed by the research question and hypothesis in another section, followed by literature review. The forthcoming section includes methodology, which
is followed by results and discussion. Finally, the paper concludes with policy implications and conclusion in last section.

2. STATEMENT OF PROBLEM AND JUSTIFICATION:

Community Forestry Program has been implemented in Nepal, with its objectives being forest conservation and alleviation of poverty amongst CFUG. As per Kanel (2006) and Springate-Baginski & Blaikie (2013), the program succeeded in improving forest conditions. However, there is no significant improvement in livelihood of poorer households because the broader aspect of socio-economic and institutional issues has not been addressed in the program (Malla, 2000; Upreti, 2000; Varughese & Ostrom, 2001). Many studies suggest that socio-economically marginalized HHs receive disproportionately less benefit and are alienated from decision-making process compared to better-off HHs in the CFUG (Malla, 2000; Smith et al. 2003; Nurse & Malla, 2005; Chhetri, 2006; Kanel, 2006; Dhakal et al., 2007; Springate-Baginski & Blaikie, 2013). In addition, studies also suggest that influential HHs not only tend to control the management decisions, but also lobby with the executive management to complicate the institutional arrangement for resource distribution and limit the access of disadvantaged HHs to forest resources and benefits (Dhakal et al., 2005; Lund & Treue, 2008; Saito-Jensen et al., 2010).

Likewise, the GoN is only concern in extending the CF program nationwide without considering impact of program up on the livelihood of the community (Sunam et al., 2010). Number of households depends on the Community forest to fulfill their energy demand for cooking, grass and fodders for their livestock, woods for ritual purposes and timbers for construction. Nevertheless, the government controls and impose of CF program have limited their access to subsistence resources (Ban jade et al., 2007).
Thus, many researches supported that disparities exist in resource distribution based on HHs socio-economic attributes in various CF. However, limited research are conducted in the specific research site, BCF on this topic (Branney & Yadev, 1998; Malla, 2000). This study has examined the association between HHs attributes and resource consumption in order to find either the problem exists in the specific research site or not. Also, the study reviewed the institutional arrangement to examine if resource distribution on ground level is based on their operational plan (constitution) or not. Based on the findings, policy implications are proposed to ensure the equitable distribution to meet the objective of CFP.

Beside aforementioned issues, social exclusion and marginalization of traditionally disadvantaged groups; elite capture of benefits and decision-making processes; and transparency in managing CFUG funds are other emerging issues in community forest program (Kanel & Kandel 2004; Chhetri 2006; Adhikari et al., 2004). They can be the topics for the further research.

Such studies have been conducted in different community forest of Nepal but there has not been any significant research on Baghmara Community forestry. BCF has adequately matured in community forestry program implementation and has been in practice for a long period since 1996 so it is the preferred study site to evaluate the subject matter. In addition, this is the first study to include economic variables as dependent variables, and explore association of HH attributes and consumption of resources using the primary data collected from the field survey in that specific community forest.

3. RESEARCH QUESTION:

The aim of this research is to explore the institutional arrangements within the CFUG for the distribution of benefits derived from the CF. It also, examines disparities that exist in
resource distribution based on the social, economic and geographic attributes of the HHs participating in Community Forestry Program. To be more specific, the study seeks to answer the following research questions:

- What are the institutional arrangements for resource distribution in Baghmara Community Forest?
- What is the correlation between household attributes and resource consumption?

4. HYPOTHESIS:

CFUGs are generally heterogeneous based on social, economical and physical aspects of their livelihoods. This study considers income level, landholdings and livestock holdings as the economic attributes; caste, household size and participation as social attribute; and distance from the forest as geophysical attribute of the HHs participating in CFP. In this study, these stratifications refer to socio-economic heterogeneity among the User Groups.

Resources refer to both direct and indirect benefits receive from the community forest. For the purpose of this study, firewood, timber and grass are considered as the natural resources where as, financial and material assistance for toilet construction, children education and training programs provided to members of CFUG are considered as economic benefits.

The extent of dependency on a particular resource is often associated with HH attributes such as ethnicity, household size, income, wealth, proximity and gender of household head (Kerapeletswe & Lovett, 2001). Thus, resources consumed and benefits received from the community forest by the HHs depend upon their HH determinants. Based on this argument, it is hypothesized that socio-economic attributes of HHs have strong association with forest products consumption and other benefits derived from the program.
For the purpose of this study, following specific hypothesis have been derived from the general hypothesis.

**Hypothesis I: Distance is negatively correlated with resource consumption**

Varughese & Ostrom (2001) and Varughese (1999), in their studies stated that in any community, HHs nearby the forest have more secure and accessible supply of forest products and benefits irrespective of any restriction or distributional rules implemented. Likewise, studies conducted by Gunatilake (1998), Chhetri (2005), Musyoki et al. (2013) and Leon (2013) also suggested that HHs living closer to the forest relatively consume more resources and benefits compared to HHs living far. Nearby HHs have more opportunity cost and they can collect resources in less time and cost, which is expected to increase their consumption. Thus, it is hypothesized that distance have negative correlation with resource consumption.

**Hypothesis II: HH size is positively associated with consumption of resources**

Demand for forest resources is higher for the HHs having bigger family size compared to small family size. Studies conducted by Kumar & Hotchkiss (1988), Heltberg et al. (2000), Adhakari et al. (2004), Chhetri (2005), Baland et al. (2013), Leon (2013) and Musyoki et al. (2013) suggested that HHs with large family size have more labor force available for resource collections and generally their consumption of resources is higher and their participation in CF activities are comparatively higher. Thus, it supports the hypothesis that HH size has positive association with resource consumption.

**Hypothesis III: Lower caste household are expected to collect less resources compared to higher caste household**

Caste of the household influences their cultural attitude towards living style, food, rituals and consumption of resources (Leie, 1997). Lower caste HHs usually have less
number of livestock and land, which decrease their demand for resources. As mentioned in studies conducted by Leie (1997), Graner (1997), Adhakari et al. (2004) and Chhetri et al. (2005), the lower caste HHs who are considered as untouchables, are less likely to participate in CF activities and are deprived of benefits provided by the program compared to upper caste HHs. Thus, it is hypothesized that caste has positive correlation with benefits and resource consumption from CF.

**Hypothesis IV: Wealth has positive association with benefits and resources consumption**

Wealth, in this study is measured in term of total number of livestock holdings and land holdings, is expected to have positive correlation with resource consumption and benefits sharing. HHs having more number of livestock and land are more inclined to use CF to meet their demand. Malla (2000), Adhakari et al. (2004), Adhakari (2005), Chhetri (2005), Dhakal et al. (2007), Leone (2013) and Baland et al. (2013) in their studies conclude the same findings that wealthy HHs get more benefits and resources from the CF compared to less wealthy HHs. It supports the hypothesis.

**Hypothesis V: Participation has positive correlation with resource consumption**

In this context, Participation is measured through meetings attended and visits to CF office by the HH member. It is expected that HHs participating more in CF program are benefited comparatively higher than non-participating HHs. HHs who attend meetings and involve in other activities of CF have correct information about time and procedures for distribution of resources and other beneficial activities such as training programs, job openings (Gaspart et al., 1997; Adhakari et al., 2004; Adhakari, 2005). Thus, it is hypothesized that participation has positive relationship with benefits and resource consumptions.
Hypothesis VI: Income has negative association with benefits and resources consumption

HHs having higher level of income are less willing to trade off their time for the collection of subsistence resources, but they might have preference for high value resources (Malla et al., 2003; Dhakal et al., 2007). Moreover, higher income HHs use alternate source of energy and they have less dependency upon forest products for their livelihoods. However, they might have influence in decision-making process and management level to fulfill their self-interest (Dhakal et al., 2005). Thus, it is expected that HHs with higher level of income are less likely to consume resources in comparison to poorer HHs.

5. LIMITATIONS OF THE STUDY:

• The study is based on small sample size of 80 households. The result might not be representative and might lack power to detect statistically significant associations between variables.

• Some of the variables like gender, age, and technologies to harvest resources have not been included in the study. It might cause omitted variable biasness.

• The study focused on specific site, the Baghmara Community forest. Thus, it might not be representative to learn the whole picture.

6. BACKGROUNDS AND CONCEPT OF COMMUNITY FORESTRY PROGRAM:

In order to understand the general background and concept of community forestry, literatures related to evolution of community forestry, socio-economic attributes of CFUGs, types of resources and benefits distributed from CF, institutional arrangements for benefits sharing and major stakeholders in CF program are presented in this section.

In a developing country, dependency of rural households on common pool resources (CPRs) and their diverse utilization pattern have become essential topical issues. CPRs comprise both natural and human constructed resource systems regardless of the property rights involved. Ostrom et al. (1999) defined CPR as sufficiently large that it is difficult, but not impossible, to define recognized users and exclude other users outside the group from using the resource. CPRs are also rivalrous in nature where one individual’s consumption of such resources subtracts accessibility for others. In other words, CPRs have non-excludable characteristic of public goods, and also have the rivalry characteristic of private goods. The mixed nature of CPRs creates dilemmas in which an individual has the temptation to free ride (Sapkota & Odén, 2008) and has no incentives for maintaining the resources. The externalities related with individual actions lead to depletion of natural resources (Adhakari et al., 2004) and threaten sustainability and utilization of common resources. So, it requires appropriate management approach.

Being constrained in supply yet open for community usage, the sustainable management of CPR is challenging issue for both policy implementers and the scholars (Sekher, 2001). As CPRs cannot be managed at the individual or household level, it requires the participatory approach (Meinzen-Dick & Knox, 1999). In a time period, various institutional arrangements have been proposed for its sustainable management. Among them, institution building at the community level has emerged as the most feasible option for both ecological and economic sustainability of CPRs. This approach established well-defined community based property rights over these resources and generated incentives for the community to internalize the externalities. Even many scholars advocate for the decentralized
collective management of CPRs by the user group for overstating the 'tragedy of the commons' (Jodha, 1986; Ostrom, 1990; Bromley, 1991). As a result, more than hundred nations are presently pursuing Community Forestry initiatives that deliver some sort of local users control over the resources (Agrawal, 2001; Wily, 2005). In context of Nepal, the introduction of Community Forestry Program has led to devolution of forest management right from centralized government control to Local User Groups. The National forests were handed to the Forest User Groups (FUG) for its conservation, utilization and management.

6.2 Evolution of Community Forestry in Nepal:

Forestry in Nepal can be studied under three historical phases namely privatization (until 1957), nationalization (1957 to 1970s) and recently decentralization (1970s onward) (Hobley 1996; Ojha et al., 2009). In the history of Nepal, until 1957, forests were under the control of feudal system. Forest resources were treated as their private property by the rulers, their appointees and the elite groups (Joshi, 1993). With the shift in regime, the democratic government implemented the first forest legislation i.e. Private Forest Nationalization Act of 1957. The act was enforced to transfer the private ownership of forest to the government. In Contrary (counteraction), this approach incentivized the private forest owners to clear down the forest of their land in order to maintain their property right over the land (Mekonnen & Bluffstone, 2008). It increased the rate of deforestation (Hobley, 1985; Shrestha, 1996). A total of 2.3 million ha of forest was lost from 1964 to 1975 that was almost one-third decreased in total forest over a decade (Wallace, 1981). Between 1950 and 1975, Nepal was the highest in deforestation rate with 4.1% among the south East Asian countries (Thapa & Weber, 1990). The government then realized that the current bureaucratic mechanism was an old-fashioned, trickle-down and state-centric approach (Ojha et al. 2009), which could not
control and protect the forest without the participation and support of local communities (Pokharel, 1997). Meantime, the growing perception of people toward the self-governance and widespread democratization process has further strengthened the decentralization and community participation in natural resources management (Ojha, Persha & Chhatre, 2009). Thus, participatory management approach was introduced in forestry sector.

In 1976, a National Forestry Plan was drafted and, according to Pokharel (1997) for the first time, the plan recognized the role of local communities and emphasized their participation in forest management. The management of local forests by communities was considered more practical way to ensure conservation and a sustainable supply of forest products for subsistence needs (Sharma, 2010). Thus, the government implemented Community Forestry Program in 1978 as a decentralization process of forest governance.

6.3 Paradigm & Attributes of Community Forestry:

As different policy and procedures of Community Forestry are in practice in different region of the world, there is always on going debate about what defines Community Forestry in common (Brendler & Carey, 1998). Following paragraphs explain the gradual change in the concept and definition of community forestry program.

Tracing back to the history of CF development, FAO (1978) broadly defined CF as any situation that intimately involved local people in forestry activity. It is based on the beliefs that there exist intimate synergies between local people and their environment (Stevens, 1997). However, Duinker et al. (1994) criticized the FAO’s definition stating that it lacks detail explanation in three issues: decision making authority, representation and equity. In order to address the issues, Gilmour and Fisher (1991) defined community forestry as the control and management of forest resources by the rural people who use them especially for
domestic purposes and as an integral part of their farming systems. Later on, Martel & Whyte (1992) defined Community forestry as a village-level forestry activity, decided on collectively and implemented on communal land, where local populations participate in the planning, establishing, managing and harvesting of forest crops, and so receive a major proportion of the socio-economic and ecological benefits from the forest. Likewise, Shepherd (1985) also defined CF as any form of forestry activity undertaken specially and principally to provide communal benefits to the people living in villages or small communities in the vicinity of the forest area, which involves them directly in its management. As per the three different definitions, all of them emphasized the local community as representative and decision making authoritative. People’s participation in decision-making is taken as the central idea of community forestry (Eckholm et al., 1984). Unlike Martel & Whyte and Shepherd, Gilmour & Fisher attempted to shift the emphasis of CF solely from participatory to livelihood approach. However, they confined community forestry only at the village level, and disregard the fact that potential of communities can also be practiced in urban areas and wherever it is feasible.

In order to integrate all the components of CF, Ojha et al. (2009), in their article, explained community forestry as a complex set of social-ecological interactions, involving local communities and their institutions, government policies and programs, and associated technical, institutional, and political processes at multiple levels, that affect forest management choices and actions of local people. This concept of CF attempt to explain the interesting dynamics involved between local communities and resource management approaches. In addition, Carter (2010), in his recent work, defined community forestry as an approach to forest management that actively promotes the rights of the people living in and
around the forest to both participates in forest management decision and to benefit financially and in kind from the results of the management. Carter’s definition promotes the sense of ownership and explain better version of both participatory and livelihood approach.

*In Nepal CF is acknowledged as a demonstration of local democracy in action- one where local people have successfully taken control of an important aspect of their livelihoods. Internationally, it is regarded as a model demonstrating the sometime difficult paradigm shift from government-controlled forestry to active people’s participation- one that is observed with keen interest for lessons that can be learnt and applied elsewhere.* (Pokharel, Branney, Nurse & Malla, 2007).

Thus, Community Forest is ambiguous concept, the clear concept of CF can be better understood only through analyzing and understanding the components of CF. Shrestha (2005) argued that variation in definition of CF is due to general misunderstanding about the basic components of CF. Ostrom (2007) and Basurto & Ostrom (2008), in their study classified attributes of CF as institutions, resource system and user groups’ characteristics. However, for the purpose of this study, major components of CF: institution, stakeholders, Community forest User Group’s attributes and resource distribution mechanism has been explained in following paragraphs.

**6.3.1 User Group’s Attributes:**

Ostrom (1990) emphasized on resource dependency as one of the important attribute of User Groups for providing collective action in common pool resource management. Households having higher dependency on forest for resources place greater value on resource’s long-term sustainability compared to households that are not dependent up on forest (Gibson et al., 2007). Resource dependency of a household can be due to difference in social, economic and cultural aspect of their livelihood (Basurto & Ostrom 2009).
Generally, community is composed of different ethnic and religious groups with their own social and economic structures. The composition differs from one geographic region to another (Varughese & Ostrom, 2001). In context of Nepal, various socio-economic and geophysical factors such as gender, religion, ethnicity, caste, income, wealth and distance influence the participation of households in community forestry activities (Maskey et al., 2003). Usually households with same ethnicity or caste live in physically separate cluster in a community. Sometime, in the CFUG, one or two castes outnumbered the other. But the upper caste dominates the lower caste in decision-making and participation in Community Forestry Program (Lachapelle et al., 2004). Sometime ethnically heterogeneous User Groups have difficulties in organizing and sustaining cooperation to manage the forest resources (Chhetri & Pandey, 1992). Likewise, economic endowments are directly related to the extent of economic stratification within the User Groups (Varughese, 1999). In most cases, the occupation or livelihood strategies of households determine their economic status. In general, households with low income depend upon forest resources as an integral part of their daily subsistence whereas; better off households have commercial interests in forest. Similarly, the relative proximity of some User Groups compared to distance traveled by other users affects the symmetry of relationship among user groups and the resource utilization (Varughese, 1999).

Beside sociocultural backgrounds, individual households differ along a diversity of dimensions including their interests and endowment (Keohane & OStrom, 1995; Baland & Platteau, 1998). However, the benefits from forest attracted all the users, actors and stakeholders irrespective of their socio-economic attributes for the management of forest. These actors and stakeholders have different interests and they maintained distinct
interactions with the forest, in order to fulfill their economic, political, social and cultural needs.

6.3.2 Resource System:

Ostrom (1990) defined resource system as a stock that under favorable conditions provides maximum resource units without harming the resource system itself. In addition, resource unit is what user can abstract from the resource system. Firewood, fodder, grass, logs, timbers, leaf litter, fruits, herbs, agricultural implements are the most common resource units obtain from community forestry. The quantities and qualities of resource units available in CF depend up on the type, location, area and productivity of the forest.

Quantity of resources and the economic value of forests are the incentives for the local communities to participate in management program. These incentives help to shape the positive attitude of users towards the sustainable management of resources (Agrawal & Lemos, 2007). Many studies show that two third of firewood demands are fulfilled through the forest and rest comes from private forests and agricultural residues. Around 40% of livestock feed like grass, fodder and leaves are obtained from the forests (Chapagain et al., 1999).

Beside natural resources, Community Forest is providing economic benefits to the local communities. It has been a source of income and employment opportunities (Pokharel, 2008). Earning activities include sales of forest products (fire wood, poles, timbers, seeds, tree seedlings), membership fees, touristic activities (if feasible), fines, donations, and rewards (Maharjan, 1995; Hunt et al., 1996). Thus, CFUG creates the fund and provides financial assistance for infrastructure development, community development activities and loans to the members for productive investment.
For those Community Forests closer to national parks and with wide range of biodiversity, eco-tourism can be another income generating activities. Poudel (2010), in his study, explained Baghmara Community Forest near Chitwan National Park as one of the best example for CF practicing eco-tourism. Various touristic activities such as elephant safari, bird watching, jungle safari, night stay in machan, boating, and elephant bathing are conducted within the forest. The annual income of the Baghmara CFUG was Rs. 97,39,267 for the fiscal year 2010/11(Sharma et. al, 2012). Beside the administrative and operational costs, most of the revenue is spend for the infrastructural development such as road construction, river embankment, community schools’ buildings, and social welfare activities (sharma et. al, 2012).

6.3.3 Institution & Institutional Arrangement:

There is general agreement among the scholars that institutions play essential role in management of forest resources, but no significant consensus among them about the type of institution or tenure agreement that is more appropriate for sustainable resource management. However, the empirical evidences show that community level user groups are capable of creating effective governance rules for sustainable management of resources. Thus, Community Forest User Group (CFUG) emerges as a strong institution in community forestry program.

Ostrom (1990) defined institution as a set of rules at work that determines who is able to make decisions and be involved in an action, what relations are taken among the actors, and what actions are allowed or constrained. Further, the author classified the rules into three different levels: operational rules, collective-choice rules and constitutional-choice rules. In general, operational plans include rules about when, where and how to withdraw resources
and who monitor others’ actions and how. Operational plans are formulated based on collective-choice rules. Whereas, power structure, associated power, collective-choice rules and other amendments are made based on constitutional-choice rules. CFUG, as an institution, conducts its activities based on aforementioned rules. In addition, well defined land base, type of resources, attributes of user groups, property right, tenure options, models of administration, decision-making process, people participation and financing are the other major prerequisite for the communities to establish Community Forestry as a strong institution (Duinker et al., 1994). Beside these, other several interest groups and multiple level stakeholders also affect the institutional process. However, the sustainability of an institution mostly depends up on how its constituents are integrated with each other and also, up on the interrelation and coordination among the components and line agencies. Sustainability and success of CF as an institution also depend up on interaction amongst different level of stakeholder and their role; benefits sharing mechanism; and monitoring mechanism.

6.3.4 Stakeholders and their Role:

Various interest groups and stakeholders are involved in the community forestry program. Those stakeholders can be studied under three different levels namely: national, meso and local levels. It also includes other NGOs and INGOs. Major influential interest groups involved in Community forestry program are discussed in the following section.

6.3.4.1 National Level Stakeholders:

National/centeral level stakeholders comprise of parliament, Ministry of Forest and Soil Conservation, Department of Forest, Forests Directorate Office, Community Forestry Division and other government level organizations. They exert the constitutional level rights
over the forest resources of the nation. The role of central level stakeholders is to formulate plans and policies, and implement them. Community forestry guidelines, directives, forest sector policies, master plans for forestry and other reforms are the policy outcomes derived directly from national levels. They constantly monitor and evaluate the CF and support CF whenever required. The general interest of these groups are environmental protection, biodiversity conservation, policy formulation/implementation and revenue collection. Central bodies always have authority to take action against the meso and local level stakeholders if they are found guilty.

6.3.4.2 Meso-level Stakeholders:

Meso level stakeholders represent the interest groups that disseminate the power and authority from national to local level stakeholders. Meso-level institutions carry out important facilitation, technical and information exchange functions between national level and local level interest groups. In general, such intermediate level interactions contribute to local level institutions to better understand their right and responsibilities. District Forest Office and Federation of Community Forestry Users of Nepal are the two major meso-level stakeholders involved in CFP.

**District Forest Office (DFO):**

DFO is one of the intermediate government bodies that have the authority to hand over the government forest to the local community. They exert constitutional level rights authorized by the national level. The roles of DFO are to assist communities to form and register CFUG, approval of operational management plan, monitoring, evaluation of the CFUG and conflict resolution.
**Federation of Community Forestry Users of Nepal (FECOFUN):**

FECOFUN is the nationwide networks of all Community Forest User groups (CFUGs) of Nepal. Ojha et al. (2007) argued that increasing the influence of Forest User Groups through networking or, building federations of CFUG as a form of strong civil society supportive would strengthen their capacity. FECOFUN seeks to lobby the government on the behalf of its member’s CFUG and to circulate information about CF more extensively (Agrawal & Ostrom, 2001). At present, FECOFUN is considered as a key player in forestry sector policy debates (Ojha & Timsina, 2008). The major roles of FECOFUN are promoting the civil rights agenda on forestry program; creating civic resistance to trickle up government decisions; augment service delivery; influence policy development processes; conflict resolution; and bridging local and national levels stakeholders (Ojha et al., 2007). It also facilitates to form new Community Forestry User Groups in newly initiated CF, formulate operational plans for CF and assist to maintain the treasury of the CF. FECOFUN has been playing the role of CFUG’s watchdog in both national and international policy arenas.

6.3.4.3 Local Level Stakeholders:

Local Level Stakeholders involve CFUG, Community Forest User Committee (CFUC), CFUG assembly, women groups, sub committees, clubs and other community groups. At the local level, there is provision for subcommittees within CFUGs and the formation of elected hamlet-level representatives to ensure that concerns of various constituencies within the CFUGs were expressed (McDougall et al., 2008). Implementation of CF operational plan, audit report, election of CFUC, day to day work, yearly plan, social empowerment are the general functions of Local Level Stakeholders. Major two actors of local level stakeholders are mentioned below.
Community Forest User Groups (CFUGs):
According to the *Forest Act 1993 & Forest Regulations 1995*, CFUGs are self-governed local organizations registered with DFO who have the legal proprietors right to enter and harvest the products from forest (GoN/MFSC 1995a,b). They have their own guidelines and operational rules to determine whether there are any constraints on the timing, technology and purpose of use, and quantity of resources harvested (Bruce et al., 1993). Every CFUG have their own institutional arrangement related to appropriation and provisional rules, detection and graduated consents, collective-choice arrangements, conflict resolution mechanism, and monitoring mechanism (McGinnis & Ostrom, 1996). They perform the basic tasks such as approval and implementation of operational plan, yearly plan of CF, election of executive committee, participation in assembly and distribution of resources. In principle, CFUGs can decide which forest products can be harvested, set the price for forest products, earn and distribute revenue, and spend income for community development activities (Acharya, 2002). Use of revenue for infrastructure development, livelihood products timber, NTFPs, environmental service, social development and empowerment are the benefits that CFUG seeks from the CF. Their activities are monitored by the district forest officers.

Community Forest User Committee (CFUC):
General members of CFUG elect ten to fifteen members within the group to form an executive committee known as CFUC (Chhetri et al., 2012). CFUC possess operational rights of access and withdrawal of resources, and a collective-choice right of management. In addition, they have right to decide on construction and maintenance of facilities, authority to devise limits on harvesting rights, and the ability to enforce limits on any benefits derived form CF.. They are responsible for day-to-day task of protecting forest, allocating benefits
from forest, contacting to the District Forest Office and controlling the wrongdoings. Their interests are focused on income generation, expenditure for environmental protection activities and social development.

6.3.4.4 NGOs and INGOS:

Other influential interest groups are the various NGOs and INGOs working for the environmental conservation. To name few, IUCN, Livelihood forestry program (LFP), Danish International Development Agency (DANIDA), ICIMOD, CARE Nepal, Biodiversity sector program for Siwaliks and Terai (BISEP-ST), are actively involved in Community Forestry Program in Nepal. These organizations are involved in supporting various trainings, entrepreneurship and awareness programs for community empowerment. They also assist the CF for preparation of operational plan, and also assist in conflict resolution. They seek to contribute to global conservation, social development, community empowerment, participation and attend development goals.

7. PROVISIONS FOR RESOURCE DISTRIBUTION IN BAGHMARA CF:

CF has to distribute the forest resources and other economic benefits on the basis of provision made in the operational plan (OP). In general, resources are distributed among the members of CFUG for their household purposes. In Baghmara Community Forest, firewood, grass and timbers are the basic resources provided from the forest. Beside natural resources, the CF also provides economic benefits to households through CFUG’s fund. Usually, the fund is spent for infrastructure development, river embankment construction, school building, and other social welfare activities.
7.1 Firewood Distribution Mechanism:

Unlike other CF, the distribution of the firewood is on the sale basis in Baghmara CF. Every year, the old and dried trees are collected for firewood and sold to the members of CFUG at the minimum cost of Rs 150 per quintal. Each HH can get three quintals of firewood at maximum. The community forestry user committee (CFUC) decides the quantity and price of firewood.

7.2 Grass Distribution Mechanism:

The distribution of grass is free for members of CFUG. Each member can collect one bhari (equivalent to 20kg) at a time. The CF allocates the certain time and areas of forest for harvesting grass. Users are restricted to enter outside the allocated area for grass collection.

7.3 Timber Distribution Mechanism:

Baghmara community forest has a unique procedure for timber distribution. It is based on lottery system. Once in a year, the lottery is conducted. HHs of CFUG can participate in the lottery and the amount of timber they collect depends up on the coupon they withdraw in lottery. Usually, the coupons have value from 0 to 7, 0 implies nothing and 7 implies 7 cubic feet of timber.

7.4 Economic Benefits Distribution Mechanism:

Beside forest products, most of the CFUG generates financial resources through sales of forest products (fire wood, poles, timbers, seeds, tree seedlings), membership fees, fines, cash payment by members in lieu of labor, contributions, donations, and rewards and support from the District Forest Office and field projects for plantation and protection activities
(Hunt et al., 1996). The level of income of CFUGs varies widely and depends on the size, condition and type of forests; the level of forest utilization; the type and proximity of markets; and the kind of income-generation activities practiced (Malla, 2000). Out of total revenue collected, 25 Percent of fund is invested for the forest management activities and remaining funds are invested for infrastructure development, social development, operation of CFUG, empowerment and community development activities, based on common consensus of CFUG. At HH level, Baghmara CF provides financial assistance and materials for toilet construction and biogas installation, scholarship for children education and training programs for the youth.

7.4.1 Financial Aid for Sanitation and Alternative Energy:

Every HH in CFUG get one-time financial assistance or materials for toilet construction and biogas installation. Biogas is the alternate source of energy provided to HHs in order to minimize their dependency upon forest resources for energy. The assistance provided to HH depends upon their need and also the availability of fund in CFUG’s fund. CFUC decides about which HH can get assistance and how much it can get. It is one of the programs conducted by CF to minimize the dependency of HHs up on forest for firewood.

7.4.2 Assistance for Children Education:

Similarly, the Baghmara CF has established a community school for the poorer and economically backward community. It also provides scholarships and free books to the needy and economically weak students of CFUG. CFUC decide on scholarships and funding issues.
7.4.3 Capacity Building Program:

In order to empower the community and develop human capital, the CF provides various type of training programs like cutting and sewing, languages, electrician, plumbing and so on. The CFP targets the youth population. Training opportunities are provided to any willing participants and they are chosen on first come first serve basis.

Although CF are required to carry out their day to day activities and distribution of resources and benefits based on their operational plan, the study shows that resources are not distributed as stated in the operational plan in Baghmara Community Forest. Thus, the study reveals the contrast between the provisions of resource distribution and distribution in the grass-root level.

8. EMPIRICAL LITERATURE REVIEW:

The study done by Maskey et al. (2003) in the “ludi-damgade” CF of Nepal found that socio-economic determinants like age, gender, ethnicity and wealth have a significant effect on participation in CF management program. They took survey data from 443 households. Their study also suggested that participation in community forestry program is based on the socio-economic background of the household and their level of participation is determined by the benefits obtained from the forest. For their analysis, an ordered probit model was used to determine the effect of socio economic attributes upon participation and secondly, a linear regression model was used to identify the correlation between benefits received and level of participation. The result showed that benefits received from forest increased with higher level of participation.
Babulo et.al. (2008), conducted a survey with 360 sample households in Tigray, Northern Ethiopia to identify the factors that influence a household’s choice of livelihood strategy focusing on extraction and dependency of HHs on forest products. The study suggested that the factors that condition a HH’s reliance on forest products vary depending on the resource endowment of the household, the HH’s demographics, economic characteristics, and other exogenous factors such as markets, prices and technologies.

Beyene (2011), in his study used data from a random sample of rural households in Ethiopia to examine the role of local institutions and socioeconomic characteristics of households on the forest dependency on community forest. The study showed that variables such as household head’s age, off farm activities, livestock holdings, forest density and access to private sources have more significant effect on consumption of forest products and less effect of local level institutions.

Adhakari (2003), in his empirical study examined the relationship between household socio-economic characteristics and their dependency upon community forest. The data from sample size of 309 households from the mid hills of Nepal was analyzed using regression model. His result shows that HHs attributes such as landholding, livestock holdings, HH composition, gender, caste, education and technology of harvesting have more significant influence on HH decision for extraction of forest products than other factors. He concluded that HHs with less productive assets are currently facing more limited and restricted access to CF than relatively better off HHs. He also argued that current CF management approach is more oriented towards producing intermediate forest products that serve the interest of better off HHs and neglect the concerns of the poorer HHs who are more dependent upon NTFPs for their livelihoods. He then, recommended NTFP-oriented management systems and direct
involvement of women and marginalized units of the community to increase the access of poorer HHs to CF and promote the equitable resource distribution.

Adhakari et al. (2004), in their study, used both quantitative and qualitative analysis to study the association between HH attributes and usage of common property resources in order to examine whether poorer HHs are able to gain greater access to CF as a result of institutional change. For their analysis, household survey’s data were taken from eight different FUGs from two districts; Kabhre Palanchok and Sindhu Palanchok of Nepal. The evaluation suggested that forest products collection from CF is dependent on various socio-economic characteristics. The result showed significant association of landholdings, livestock holdings, caste, education, distance, and household economic status with consumption of resources from community forest. The study concluded that poorer HHs are facing more restricted access to CF compared to better off HHs.

Smith et al. (2003), conducted the study among four user groups with 400 households of Tanahu district of Nepal. They argued that Community forestry program has greater potential to improve the livelihood of poor people through the provision of basic forest products, but the traditional caste and wealth structures of HH has hindered its performance. In their study, they identified similarities and differences between the perception of different caste and wealth class HHs towards the CF. Dependency of lower caste and poor HH is high in common resources, but the establishment of CF has limited and controlled their access. The result showed that wealthier and higher caste HHs are more likely to feel benefited from CF in comparison to less wealthier HH and lower caste HHs. Poor HHs perceive less benefits because they are not getting sufficient fuel wood, grass and fodder from the forest.
Adhakari (2002) in his paper examined how the socio-economic characteristics of HHs determine their decision for labor allocation and forest product collection. The study was conducted in two districts of mid-hills of Nepal and households survey was conducted to collect the information. The result shows that HH attributes such as land holdings, livestock holdings, HH composition, gender, education and participation have significant influence on HHs decision for labor allocation for extraction and gathering of resource from common property forest. He also argues that conservation-oriented CF programs favor the wealthier HHs and do not contribute significantly to the livelihoods of poorer and vulnerable sections of the community. He suggested effective policy and institutional interventions to ensure efficient and equitable access of resources to the community members.

9. DATA AND METHODOLOGY:

9.1 Study Site:

Baghmara Community Forest is located in the Bachhauli Village Development Committee (VDC) in Chitwan district of Nepal. It occupies most part of Bachhauli to the east and south. It is separated with Chitwan National Park (CNP) by Rapti River in the west and north. The Community Forestry User Group comprises of four wards including villages like Badreni (ward no 1), Sauraha and Odra (ward no 2), Malpur, Makbudi,
Sishuwar and Mushihar tole (ward no 3) and Mainaha and Padhariya (ward no 4). The forest is contiguous with Chitwan National Park (CNP) and forms a part of Barandabhar corridor forest. The corridor forest is very critical habitat, which connects CNP with the middle mountains, the Mahabharat hill of Nepal. The CF covers an area of 531.28 Acres, of which 402.78 Acres is purely plantation and regeneration site. The GoN handed over the forest to the User Group for management in 1995. It was approved as Community Forestry in 1996.

9.2 Data and the Data Source:

The study is based mainly on primary survey data and other information collected through secondary sources. Required data on HH attributes and their consumption of forest resources from Baghmara Community Forestry are taken from the previous study conducted in 2011 by the researcher himself for the fulfillment of his under graduation degree at Kathmandu University from the thesis entitled “Disparity in resource distribution: a case study of Baghmara Community Forestry”. The unit of analysis is household (HH). It includes sample size of 80 Households out of total 950 HH included in CFUG. Data on socio-economic attributes of HH such as family size, total income, caste, number of livestock, total landholdings, distance from forest, number of meeting attended and number of visits to CF office along with the data on quantity of resources consumed such as firewood, grass, timber and the economic benefits received for toilet construction, children education and training programs offered by CF are taken for the purpose of this study.

Other required secondary information regarding the institutional design, operational plans, attributes of CFUGs are collected through relevant sources such as Ministry of Forestry and Soil Conservation, District Forest Office, Baghmara Community forestry office, Central Bureau of Statistic, Audit report and other various literatures.
9.3 The Variables: Definition and Summary Statistics

The study examines the association between dependent variables i.e. type of resources and benefits received from CF and independent variables i.e. HH attributes. Following section presents summary of the descriptive statistics of both the dependent and explanatory variables used in the empirical analysis.

9.3.1 Dependent Variables:

Both, natural resources and economic benefits that the HH of CFUG is getting from the Baghmara Community Forest are represented in dependent variables. It has been categorized under two subheadings: Natural Resources and Economic Benefits.

9.3.1.1 Natural Resources from Forest:

It includes both the timber and non-timber forest products. In our study, firewood, grass and timber are the three basic natural resources that are taken under consideration.

**Firewood:**

Firewood is distributed once in a year labeled with the minimum cost. The unit of measurement is quintal (1 quintal equivalent to 48.95 kilogram). The mean quantity of firewood consumed by HHs is 1.8125 quintal. The values vary from 0 to 3 quintal. HH not consuming any amount of firewood is assigned the value 0. Other HHs collect minimum of 1 quintal to maximum of 3 quintals firewood so, they are assigned the value from 1 to 3 depending upon the amount of firewood they collected.

**Grass:**

Grass is another abundant resource provided by the CF. It is measured in bhari (1 bhari is equivalent to 20kg). The data provides the amount of grass collected by the HHs per
day. The average grass collected by HHs is 20.85 kg per day (1.0423 bhari). The value varies from 0 to 3 bhari (i.e. 0 to 60 kg). HHs who don’t collect any grass are assigned 0 value.

**Participation in Timber Consumption:**
Timber is distributed once in a year based on lottery system. The data represents the value 0 if the HHs are not participating in the lottery for timber consumption, else 1 for the HHs participating in the lottery for timber resource.

| Table 1: Summary table for Dependent Variables (N=80) |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| **Variables**                  | **Mean**        | **Standard Deviation** | **Maximum** | **Minimum** |
| Natural Resources               |                 |                 |               |               |
| Firewood                       | 1.8125          | 1.05655         | 0             | 3             |
| Grass                          | 1.0423          | 0.92151         | 0             | 3             |
| Timber                         | 0.5625          | 0.05581         | 0             | 1             |
| Economic Benefits               |                 |                 |               |               |
| Toilet Construction            | 2708.75         | 2103.956        | 0             | 7000          |
| Children Education             | 0.5125          | 0.50300         | 0             | 1             |
| Training Program               | 0.1875          | 0.39277         | 0             | 1             |

**9.3.1.2 Economic Benefits from Forest:**

Under this heading, three major economic benefits received from the community forestry program are explained as dependent variables. CFUC controls and allocates the fund of CF for various purposes. Households are provided materials or financial support for following purposes.
**Financial Aid for Toilet Construction:**

CFUC provides financial aid to the members of CFUG for the construction of toilet. The data provides information on amount (in Nepalese currency Rs) received by the household for toilet construction. The average amount receives by each HHs is Rs. 2708.75. The value varies from 0 to Rs. 7000. HH who doesn’t receive any assistance are coded 0 values.

**Children Education:**

CFUC provides scholarship and financial assistance for child education to the members of CFUG. The HH who receives assistance for child education are coded 1 and those HH who doesn’t receive assistance are coded 0. It is a binary variable.

**Training Program:**

The CFUC conducts various training programs in order to empower the local communities. The data provides the information about either any members of the HH has participated in any single training program in that year. It is a binary variable, coded 0 if not participated in training or 1 if participated in any of training programs.

**9.3.2 Explanatory Variables:**

The independent variables comprise of various HH attributes. The attributes are classified under following economic, social and geophysical subheadings.
Table 2: Summary table for Explanatory Variables (N=80)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Standard Dev.</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic Attributes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HH Income</td>
<td>27653.75</td>
<td>29641.86</td>
<td>3500</td>
<td>180000</td>
</tr>
<tr>
<td>Livestock Holdings</td>
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<td>2.81767</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Landholdings</td>
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<td>12.22828</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td><strong>Social Attributes</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper-caste</td>
<td>0.3375</td>
<td>0.476</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Lower-caste</td>
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<td>0.497</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Buddhist</td>
<td>0.2375</td>
<td>0.428</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>HH Size</td>
<td>5.775</td>
<td>2.2669</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Meeting Attended</td>
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<td>0.4117</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Visit to CF Office</td>
<td>0.5125</td>
<td>0.5030</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Geophysical Attributes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>0.5</td>
<td>0.5032</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

9.3.2.1 Social Determinants:

Includes the variables *Upper-caste, Lower-caste, Buddhist, HH Size, Meeting Attended* and *Visit to CF Office*.

**HH Size:**

HH size is the total number of members including both the male and female members living in the same house. The average HH size is 5.775. The data shows the minimum HH size of 2 to maximum of 12 members. It is a continuous variable.

**Caste:**

Caste has been classified into three categorical variables namely *Upper-caste, Lower-caste* and *Buddhist*. Though *Buddhist* doesn’t fall under caste system, for the purpose of this
study, households following Buddhism are considered as one of the separate caste. The average number of Upper-caste HH is 0.338; average for Lower-caste is 0.425 and 0.238 for Buddhist.

**Participation:**

Participation is measured by two different variables: *Meetings Attended* and *Visit to CF Office*. HH who attended at least one meeting in a year is given the value 1, whereas, HH not attending any meetings are assigned the value 0. The average *Meeting Attended* by HH is 0.79 per year. It is a dummy variable. Likewise, *Visit to CF Office* variable is coded 1 for HH who visits the CF at least once in a year else, coded 0 for HH not visiting CF office. The average *Visit to CF Office* is 0.51 per year. It is also binary variable.

**9.3.2.2 Economic Determinants:**

Economic attributes of HH have been studied taking *Wealth* and *HH Income* under consideration. In this study, *Wealth* is measured in term of lands and livestock possessed by the HHs. Households holding more land and cattle are categorized as wealthy HH. Whereas, *HH income* is measured in term of total earnings made by the members of a HH.

**9.3.2.2.1 Wealth:**

*Wealth* is measured by two components: *Landholdings* and *Livestock Holdings* of the HH. Adhakari (2003) and Poudel (2010) also measured wealth in term of total land and cattle possessed by the HH.

*Landholdings:*

The data provides the information about total land owned by the 80 HH on that year. The unit of measurement is *Kattha*. The average landholding by the HH is 10.76 *kattha* (0.90 Acre). The value ranges from 0 to 60. HH having no land is assigned the value 0 and the data
contains 6 observations with value 0. The data is skewed towards 0. Thus, log transformation is done after adding a value of 1 to all the observations to remove any 0 values. The average new land holding is 11.76 kattha (1.00 Acre).

**Livestock Holdings:**
Represents the total number of cattle owned by 80 HHs at the time of survey. The average number of livestock is 3.6 per HH. The values range from 0 to 12. HHs having no livestock are given the value 0 and there are 13 observations with 0 values which skewed the data. Thus, log transformation is used to make it more normal distribution. As the log transformation of 0 is not possible, a value of 1 is added to all observations before transforming the data. The new average Livestock Holdings is 4.6 per HH.

**9.3.2.2 HH Income:**
Other variable, HH Income is measured as the total monthly income of the family from different sources. It sums up all the earnings of the members of HH for that specific month. The average monthly income of HH is Rs. 27653.75 (approximately $283). It is measured in Nepalese currency. The value ranges from Rs 3500 to Rs 18000. The data is skewed towards minimum income so; log transformation is used for more normal distribution.

**9.3.2.3 Geophysical Determinant: Distance**

Geophysical attribute includes the Distance of HH from the forest. Based on the geographic features, the study site has been classified into two blocks: HH adjacent to the forest and HH far from the forest. HHs in ward number 1 and 3 are considered as nearby HH to CF and HHs in ward number 4 and 2 are considered as far from the CF. Figure 1 provides
detail about the site map. The data provides binary value: coded 0 if the HH is nearby the CF or 1 if the HH is far from the forest.

Table 3: Descriptive table for Geophysical Variable: Distance

<table>
<thead>
<tr>
<th>Details about the blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacent to Forest (Nearby)</td>
</tr>
<tr>
<td>Ward 1: Badreni</td>
</tr>
<tr>
<td>Ward 3: Malpur, Sishuwar, Makbudi, Mushihar Tole</td>
</tr>
<tr>
<td>Far from Forest</td>
</tr>
<tr>
<td>Ward 4: Mainaha, Padhariya</td>
</tr>
<tr>
<td>Ward 2: Sauraha, Odra</td>
</tr>
</tbody>
</table>

9.3.3 Statistical Analysis:

An econometric evaluation has been used to analyze the association of HH determinants with their decision to collect the resources and other benefits from the CF. Depending up on the characteristic of variables; different regression models have been employed to derive valid information from the variables. Dependent variables Firewood and Grass under Natural Resource variables are continuous in nature. Likewise, dependent variable Toilet Construction under Economic Benefit variables also, has the continuous data. Other dependent variables Timber (participation in timber consumption), Children Education and Trainings Programs are ordinal (binary) in nature. Thus, OLS regression models are more preferable in understanding the effect of HH determinants on those variables. For the purpose of this study, OLS regression models are used in all cases. The models analyzed the signs of the coefficients and the magnitudes of marginal effects.

Following equation represents the general model:
\[ y = \beta + \beta_1 \text{distance} + \beta_2 \text{hhsizen} + \beta_3 \text{income} + \beta_4 \text{livestock} + \beta_5 \text{landholding} + \beta_6 \text{meetingsatt} + \beta_7 \text{visitstoo} + \beta_8 \text{caste} + \epsilon_i \]

In the above equation, \( y \) indicates the dependent variables, \( \beta \)s are the coefficient values that indicate the change in dependent variables with one unit change in the associated explanatory variable keeping other variables constant, and \( \epsilon_i \) is the residual error term. The nature and characteristic of dependent variables are somehow similar so, for every dependent variable the regression is conducted with same independent variables.

Model misspecification problems such as normality of residuals and heteroskedasticity are taken under consideration. Presence of heteroskedasticity produces a greater standard error in estimation and gives erroneous result (Gujarati, 2003). Thus, Robust result is used to solve these problems. Likewise, log transformation is done wherever it is required.

10. RESULTS AND DISCUSSION:

In this section, four different regression models are presented to show how HH attributes are associated with natural resources and economic benefits consumption. Model 1 and Model 2 are presented with the result after log transformation of variables \textit{Landholdings}, \textit{Livestock Holdings} and \textit{HH Income}. Log transformations are done for more normal distribution of data. Whereas, Model 3 and Model 4 are presented as the alternative models with \textit{Landholdings} and \textit{Livestock Holdings} as binary variables. Other variables are kept same through out the four different models.
10.1 Model 1: Household Determinants and Natural Resources

Following Model 1 presents the regression analysis of natural resources consumption from CF. The first column represents determinants of HH, second, third and fourth columns present model of Firewood, Grass and Timber consumption respectively.

Table 4: Regression models for HH Determinates and Natural Resources

<table>
<thead>
<tr>
<th>Variable</th>
<th>firewood</th>
<th>grass</th>
<th>timberp</th>
</tr>
</thead>
<tbody>
<tr>
<td>distance</td>
<td>-0.7737**</td>
<td>-0.2884*</td>
<td>-0.3054*</td>
</tr>
<tr>
<td>hhsizeln</td>
<td>0.0219</td>
<td>0.0641**</td>
<td>-0.0127</td>
</tr>
<tr>
<td>logIncome</td>
<td>-0.5120***</td>
<td>0.0225</td>
<td>0.0180</td>
</tr>
<tr>
<td>loglandhol-g</td>
<td>-0.1010</td>
<td>-0.0829</td>
<td>-0.0045</td>
</tr>
<tr>
<td>loglivestock</td>
<td>0.0041</td>
<td>0.8772***</td>
<td>-0.0695</td>
</tr>
<tr>
<td>meetingatt-d</td>
<td>-0.1971</td>
<td>-0.0558</td>
<td>-0.0403</td>
</tr>
<tr>
<td>visittooff-e</td>
<td>-0.2057</td>
<td>0.1132</td>
<td>0.2041</td>
</tr>
<tr>
<td>uppercaste</td>
<td>0.0211</td>
<td>-0.0228</td>
<td>-0.1653</td>
</tr>
<tr>
<td>buddhist</td>
<td>-0.0130</td>
<td>0.3767*</td>
<td>-0.0958</td>
</tr>
<tr>
<td>_cons</td>
<td>7.5581***</td>
<td>-0.4848</td>
<td>0.7159</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>80</th>
<th>80</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>N r2</td>
<td>0.3129</td>
<td>0.7551</td>
<td>0.0312</td>
</tr>
</tbody>
</table>

Legend: *, ** & *** imply significance at 95 %, 99 % and 99.9 % probability levels respectively

10.1.1 Distance and Natural Resource Consumption:

As expected, distance shows significantly negative association with consumption of firewood, holding other variables constant. The likelihood of firewood consumption decreases by 0.774 units (i.e. 37.89 Kg) for the HHs living far from CF compared to nearby HHs. Likewise; Distance is negatively correlated and has significant relationship with consumption of Grass resources conditional on other explanatory variables. HH living far from the forest is likely to consume 0.2884 units (5.768 Kg) less grass compared to nearby HH. It might be due to free access of grass resources, and the HHs residing nearby have
higher opportunity cost. Though, *timber* resources are distributed based on lottery, the result shows significantly negative correlation between distance and timber resource consumption keeping other variables constant. Nearby HHs are more interested to participate in timber distribution than the distant HHs. The transaction cost is higher for the far away HHs.

The results are similar to Musyoki et al. (2013), Leon (2013), Chhetri (2005) and Gunatilake (1998), who concluded that HHs living nearby the forest consumed more forest products compared to HHs living in distance. In general, HH residing nearby the forest has more secure and accessible supply of forest resources regardless of any restrictive rules (Varughese & Ostrom, 2001; Varughese, 1999). This is consistent with the fact that if a forest is far away, HHs will collect less because the time, opportunity cost and transaction cost of collecting is higher (Gunatilake, 1998; Leone, 2013). Thus, distance has significantly negative association with natural resource consumptions.

10.1.2 HH Size and Natural Resource Consumption:

*HH Size* doesn’t show any significant relation with *Firewood* consumption, conditional on all other included variables. However, it shows significantly positive correlation with *Grass* consumption keeping other variables constant. One member increased in *HH size* is most likely to increase *grass* consumption by 1.282 kg per day (increase by 0.0641 units). It might be due to the fact that there is no restriction in collection of grass resources and in addition, bigger size HH has more labor force and time to collect the resources (Heltberg et al., 2000; Kumar & Hotchkiss, 1988). Likewise, *HH size* has no significant association with participation in *timber* consumption. However, positive association of *HH Size* with *Firewood* and *Grass* consumption implies that HHs having bigger family size collects more resources compared to small family. Higher dependency of
bigger HH on resources can also be possibly due to limited access of those HH to alternative sources of livelihood (Coulibaly-Lingani et al., 2009). Thus, the results imply that HH with bigger family size are likely to consume more natural resources compared to small family size.

10.1.3 Wealth and Natural Resource Consumption:

*Livestock Holdings* and *Landholdings* are measurement of wealth for this study. Wealth doesn’t show any significant association with consumption of *Firewood*. The sign of *Landholdings* is expected to be positive for Firewood and Grass consumption, but the result shows the negative association. It might be due to that HH having more land have enough *firewood* and *Grass* in their own land. The result is different than what Baland et al. (2013) and Leone (2013) found in their study where they concluded that HHs having more land and livestock consume more firewood. However, *Livestock Holdings* show significantly positive correlation with *Grass* consumption conditional on all other included variables. A unit percent increase in *livestock* is likely to increase the consumption of *grass* by 0.877 units (equivalent to 17.54 kg). Similar to Chhetri (2005) and Adhakari et al. (2004), the study shows that HH having more livestock are more inclined to use CF to meet the higher demand for *Grass*. But, there is no significant relation of *Landholdings* with the consumption of *grass*. Similarly, the result shows no significant correlation of *livestock holdings* and *landholdings* with *participation in timber* collection.

10.1.4 Income and Natural Resource Consumption:

As expected, *HH Income* has negatively significant association with firewood consumption. A one unit increases in *HH Income* is likely to decrease *firewood* consumption by 0.512 units. It might be due to the fact that higher income HH has less dependency upon
subsistence resources compared to lower income HH. The transaction cost for collection of resources from forest is higher for the higher income HH and they are less willing to trade off their time for low value resources. However, income doesn’t show any significant correlation with grass consumption and participation in timber collection activities.

10.1.5 Participation and Natural Resource Consumption:

For the purpose of this study, Meetings Attended and Visit to CF Office by HH measures the Participation. The result doesn’t show any significant correlation between participation and any other natural resource consumptions. It might be due to small sample size or due to the fact that firewood is distributed once in a year and participation doesn’t have significant influence in decision of HH to consume the resources. Likewise, timber is distributed on lottery basis so; participation has no role in HH decision to participate in lottery.

10.1.6 Caste and Natural Resource Consumption:

Caste has three categories namely: upper-caste, lower-caste and Buddhist, for the purpose of this study. None of the categorical variables show significant impact on the consumption of firewood and timber resources. It might be due to that majority of HHs in the research site were lower caste people and the same size is also small. However, Buddhist has significantly positive correlation with grass consumption. Compared to lower-caste HH, Buddhist HH is likely to consume 0.3767 units more grass resource. It might be due to the fact that Buddhist community lives proxy to forest and they have higher livestock holdings.
10.2 Model 2: HH Determinants and Economic Benefits:

Following Model 2 represents the regression analysis of HH attributes and economic benefits from CF. The first column presents determinants of HH, second, third and fourth columns present model of financial assistance for *Toilet Construction*, *Children Education* and *Training programs* respectively.

**Table 5: Regression models for HH Determinants and Economic Benefits**

<table>
<thead>
<tr>
<th>Variable</th>
<th>toiletco$n$</th>
<th>childeduc</th>
<th>trainings</th>
</tr>
</thead>
<tbody>
<tr>
<td>distance</td>
<td>-1.1e+03</td>
<td>-0.0553</td>
<td>0.0449</td>
</tr>
<tr>
<td>hhsize</td>
<td>160.7680</td>
<td>0.0399</td>
<td>0.0008</td>
</tr>
<tr>
<td>logIncome</td>
<td>-1.2e+03***</td>
<td>-0.1566*</td>
<td>0.0188</td>
</tr>
<tr>
<td>loglandhol-g</td>
<td>114.4063</td>
<td>0.0868</td>
<td>-0.0120</td>
</tr>
<tr>
<td>loglivestock</td>
<td>195.2702</td>
<td>0.1912**</td>
<td>-0.1620*</td>
</tr>
<tr>
<td>meetingatt-d</td>
<td>226.4039</td>
<td>-0.0860</td>
<td>0.0839</td>
</tr>
<tr>
<td>visittooff-e</td>
<td>-2.4e+02</td>
<td>-0.0878</td>
<td>0.1026</td>
</tr>
<tr>
<td>uppercaste</td>
<td>-1.5e+02</td>
<td>0.0394</td>
<td>0.0603</td>
</tr>
<tr>
<td>buddhist</td>
<td>-3.4e+02</td>
<td>0.3613*</td>
<td>0.2229</td>
</tr>
<tr>
<td>_cons</td>
<td>1.3e+04***</td>
<td>1.4516**</td>
<td>0.0171</td>
</tr>
<tr>
<td>N</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>$R^2_a$</td>
<td>0.2272</td>
<td>0.2557</td>
<td>0.0197</td>
</tr>
</tbody>
</table>

Legend: *, ** & *** imply significance at 95 %, 99 % and 99.9 % probability levels respectively

10.2.1 Distance and Economic Benefits:

The results show that there exist no significant correlation between *distance* and any of the economic benefits variables: *toilet construction*, *children education* and *training programs*. However, the sign of association between *distance* and *toilet construction*, *children education* are negative as expected. The reason may be that geophysical factor has no overall effect on economic benefits, and the sample size might be too small to analyze the relationship.
10.2.2 HH Size and Economic Benefits:

*HH size* has no significant correlation with any of the economic benefits variables. However, the positive sign of correlation implies that bigger size household seeks to have more economic benefits. It might also be due to the reason that the financial assistance is provided to households based on their need and economic status, not on the family size.

10.2.3 HH Income and Economic Benefits:

*HH Income* has significantly negative association with assistance received for *toilet construction*, holding other factors constant. One percent increase in the income of HH is most likely to decrease the amount of assistance for *toilet construction* by 1155.39 units. As expected, *HH income* has also significantly negative relation with *children education*. The negative sign of correlation suggests that Household having less income is most likely to get financial assistance for *children education*. However, the result doesn’t show any significant correlation between income and the trainings provided by Community Forest Program. It might be due to the reason that the training provided is free of cost so; *HH income* has no effect on it.

10.2.4 Wealth and Economic Benefits:

Both, *landholdings* and *livestock holdings* are not significantly associated with assistance for *toilet construction*. However, *livestock holdings* show positively significant relation with *child education* but *landholdings* has no significant correlation with *child education*. Likewise, *landholdings* is not significantly related to *training programs*, but *livestock holdings* have significantly negative relation with *trainings*. Though the finding doesn’t support the proposition that wealthier HH benefits more from the CF program compared to less wealthier HH, it might be due to the fact that household having less
livestock have more leisure time to engage in training programs. The reason for other mixed results can be due to small sample size.

10.2.5 Participation and Economic Benefits:

Participation, measured in term of meeting attended and visits to CF office, has no significant association with assistance received for toilet construction. Similarly, it doesn’t have any significant correlation with children education and training program. It might be due to small sample size. The other reason can be that the households get financial assistance based on their economic status, not on the basis of their participation.

10.2.6 Caste and Economic Benefits:

Caste doesn’t have significant correlation with assistance to toilet construction and training variables. It might be due to the small sample size. However, Buddhist variable has significantly positive association with child education, while controlling other variables. Compared to lower caste, Buddhist HH is more likely to get assistance for child education. It might be due to the reason that the cluster of Buddhist households reside closer to community school compared to other upper caste and lower caste households. The easy access to school might be the reason for the higher participation of Buddhist children. Meantime, the higher-caste households are generally rich and they don’t seek financial assistance for children education.

10.3 Alternative Model 1: HH Determinants and Natural Resource Consumption:

In order to check the robustness of the model, following alternative Model 1 is presented with regression result between HH attributes and natural resource consumption.
where the independent variables *livestock holdings* and *landholdings* are converted to dummy variables named *cattle* and *land* respectively. Households having *livestock* are coded 1 and 0 for the households without any livestock. Likewise, Households having land were coded 1, else 0 for not having land. Following Alternative Model 1 table presents determinants of HH in first column and natural resource variables: *firewood*, *grass* and *timber* in second, third and fourth columns respectively.

Table 6: Alternative regression model of HH determinants and natural resources

<table>
<thead>
<tr>
<th>Variable</th>
<th>firewood1</th>
<th>grass1</th>
<th>timberpl</th>
</tr>
</thead>
<tbody>
<tr>
<td>distance</td>
<td>-0.9027***</td>
<td>-0.5219**</td>
<td>-0.3158*</td>
</tr>
<tr>
<td>hhsize</td>
<td>0.0108</td>
<td>0.0933*</td>
<td>-0.0168</td>
</tr>
<tr>
<td>logIncome</td>
<td>-0.4854**</td>
<td>0.0538</td>
<td>0.0215</td>
</tr>
<tr>
<td>land</td>
<td>0.3743</td>
<td>-0.3723</td>
<td>0.1393</td>
</tr>
<tr>
<td>cattle</td>
<td>-0.2114</td>
<td>0.9904***</td>
<td>-0.1256</td>
</tr>
<tr>
<td>meetingatt~d</td>
<td>-0.1108</td>
<td>0.0436</td>
<td>-0.0320</td>
</tr>
<tr>
<td>visittooff~e</td>
<td>-0.1761</td>
<td>0.0626</td>
<td>0.2155</td>
</tr>
<tr>
<td>uppercaste</td>
<td>-0.1707</td>
<td>-0.1670</td>
<td>-0.1806</td>
</tr>
<tr>
<td>buddhist</td>
<td>-0.0961</td>
<td>0.4409</td>
<td>-0.1129</td>
</tr>
<tr>
<td>_cons</td>
<td>7.0696***</td>
<td>-0.3648</td>
<td>0.5845</td>
</tr>
</tbody>
</table>

Legend: *, ** & *** imply significance at 95 %, 99 % and 99.9 % probability levels respectively

The result doesn’t show any significant change in model 1 and the alternative Model. Almost all the variables that are significant in model 1 are also significant in alternative model. However, *Buddhist* variable was significant but it’s no more significant in this model. It might be due to the reason that *Buddhist* sample is very low (with average value of 0.23). Likewise, general alter in the sign of not significant variables are seen which might be due to small sample size or those variables might not be relevant variables in the model.
10.4 Alternative Model 2: HH Determinants and Economic Benefits:

Alternative Model 2 is presented with regression result between HH attributes and economic benefits in order to check the robustness of the model. As in alternative model 1, for this model the independent variables *livestock holdings* and *landholdings* are also converted to dummy variables named *cattle* and *land* respectively. Households having *livestock* are coded 1 and 0 for the households without any livestock. Likewise, Households having land were coded 1, else 0 for not having land.

**Table 7: Alternative regression model of HH determinants and economic benefits**

<table>
<thead>
<tr>
<th>Variable</th>
<th>toiletco~1</th>
<th>childedu~1</th>
<th>trainings~1</th>
</tr>
</thead>
<tbody>
<tr>
<td>distance</td>
<td>-1.3e+03*</td>
<td>-0.0274</td>
<td>0.0717</td>
</tr>
<tr>
<td>hsize</td>
<td>172.9017</td>
<td>0.0539*</td>
<td>-0.0062</td>
</tr>
<tr>
<td>logIncome</td>
<td>-1.1e+03***</td>
<td>-0.1624**</td>
<td>0.0151</td>
</tr>
<tr>
<td>land</td>
<td>454.1516</td>
<td>-0.0725</td>
<td>0.0328</td>
</tr>
<tr>
<td>cattle</td>
<td>126.6799</td>
<td>0.4616***</td>
<td>-0.2511</td>
</tr>
<tr>
<td>meetingatt~d</td>
<td>238.9428</td>
<td>-0.1287</td>
<td>0.0804</td>
</tr>
<tr>
<td>visittooff~e</td>
<td>-2.3e+02</td>
<td>-0.1003</td>
<td>0.1098</td>
</tr>
<tr>
<td>uppercaste</td>
<td>-13.5357</td>
<td>0.1572</td>
<td>0.0525</td>
</tr>
<tr>
<td>buddhist</td>
<td>-2.6e+02</td>
<td>0.4465**</td>
<td>0.1938</td>
</tr>
<tr>
<td>_cons</td>
<td>1.3e+04***</td>
<td>1.4878*</td>
<td>0.0359</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N</th>
<th>80</th>
<th>80</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>r2</td>
<td>0.2236</td>
<td>0.2780</td>
<td>-0.0064</td>
</tr>
</tbody>
</table>

Legend: *, ** & *** imply significance at 95 %, 99 % and 99.9 % probability levels respectively.

Aforementioned Alternative Model 2 table presents determinants of HH in first column and economic benefits variables: *toilet construction, child education* and *training programs* in second, third and fourth columns respectively.

The result shows the increase in significant level of variables compared to Model 2. Also, some new significant variables with negative association of *Distance* with *toilet*
construction and positive association of HH size with child education are seen in this alternative model. It implies that HH with bigger size are more likely to get assistance for child education compared to small HH size. Likewise, the likelihood of HH living far from the CF to get assistance for toilet construction is less in comparison to nearby HH. But, livestock holdings variable, which was significant in trainings model is no more significant when converted to dummy variables in alternative model. It might be because there is no correlation between training and having cattle or not. Also, compared to model 2, there is no significant alter in sign of correlation among variables.

Above-mentioned alternative models mostly reveal the same results as of the original models. There is no significant difference in the regression results. Thus, it can be inferred that the model specification is satisfactory and the result is robust.

11. POLICY IMPLICATION:

The results show that resources and benefits from Community Forestry Program have not been fairly distributed amongst CFUG. HH living far from Community Forest is getting comparatively less benefit compared to nearby HH. For some resources and benefits like grass, firewood, financial assistance for toilet construction and child education, the wealthier, upper caste and larger family size households are getting relatively higher than less wealthier, lower caste and smaller family size HH. Similarly, higher income households consume less of subsistence resources compared to low-income households. In order to ensure efficient and equitable distribution of resources irrespective of HH attributes effective policy and institutional interventions are required. Following paragraphs present some of policy implications.
The result shows that *distance* has significantly negative association with forest products and economic benefits consumption. Due to geographical barriers and high transaction cost, the households living far from the community forest couldn’t benefit as much as nearby households. Thus, specific measures of compensatory transfer schemes should be implemented to ensure their equal participation and contribution in management program.

Though, Community Forestry Program, to some extent, has contributed for the conservation of forest, this study implies that the program has not contributed fully, as expected, to the livelihoods of the poorer households. In general, communities are not being able to internalize the benefits generated through CF program. Unlike other community forest, Baghmara Community Forest is open for its User Groups only once in a year for extraction of subsistence products like *firewood* and *timber*. On the top of it, the minimum cost imposed on the resources has made it harder for the poorer households to access those resources. Thus, cost imposed on subsistence resources and limited access to CF has demotivated the locals to participate in forest management program. In such scenario, more effective policy is required to change existing management approach from conservation oriented to more inclusive and participatory forest management approach. The participatory approach can create incentives and increase the access of disadvantaged groups in decision-making process and benefit sharing mechanism.

Likewise, the result shows that households with more *landholdings* and *livestock* (wealthy HH) consume more forest products and get more benefits from the community forest than did households with less *landholdings* and *livestock*. In this case, even though less wealthy households are allowed to collect more resources from the forest, due to lack of land
and livestock, those resources would be meaningless for them. Thus, another policy implication to ensure the fair distribution among different wealth level households is to have transferable property rights over products from the forest. While doing so the households can sell their share of products and benefits to other households in exchange of economic benefits. The program can also lease out the part of Community Forest to the poorer household for short term for agro-forestry or cash crop cultivation in order to enhance their livelihood and bring them in mainstream of forestry management program.

Specifically in Baghmara Community Forest, the stakeholders and CFUC emphasized on raising revenue and production of high value resources. The touristic activities inside the CF and fees imposed in resources show the intension of CFUC to limit the access of User Groups to the forest and it resources. It is favorable only to better off households whose interest are on high value resources and tourism businesses. Poorer households can’t afford for harvesting fees and permits to conduct tourism-based enterprises. Thus, the primary management priorities should not be high value resource production; instead it should focus on increasing productivity of non-timber forest products and training programs like tourist guide training, hotel management training, elephant rider, house keeping training so that marginalized communities can also be benefited from touristic activities inside CF.

Beside aforementioned reasons, scarcity of resources and dependency on forest resources can be the additional reasons for conflict and uneven distribution. Thus, improving the productivity of forests, establishing transparent distribution system, providing fund for alternate energy resources can be other best policy intervention in order to meet the demand for resources and to minimize the inequality.
12. CONCLUSION:

The rules and regulations regarding the operational plan of the Community Forestry Program are not discriminatory but, the major problems are its weak implementation and monitoring mechanism which result in inequitable distribution of resources, elite-capture over resources, exclusion of poorer and disadvantaged groups from decision making, and overall benefit-sharing mechanisms. Meantime, there is a divergence among stakeholders and their interest. National level and meso level stakeholders are interested in revenue collection and forest conservation, whereas local level stakeholders are concerned about benefits from the program. It has triggered the tension, and also raised the question about the sustainability of the Community Forestry management approach. These issues can be addressed through the policy implication such as participatory management approach, review of benefit sharing mechanism, pro-poor programs to support livelihood of poorer and marginalized households.

In conclusion, the study shows that various HH attributes determine their decision to participate in the Community Forestry Program. The regression analysis shows that the geophysical attribute, distance has a significantly negative correlation with natural resources and economic benefits consumption. Nearby households have more privilege and better access to forest resources and other economic benefits compared to households living in distance. Other socio-economic attributes like household income, size, wealth, participation, and caste also has an equally significant association with one or another natural resources and economic benefits. The result shows that upper-caste, wealthier, and larger family size HHs are getting comparatively more benefits in terms of both resources and assistance compared to lower-caste, less wealthier, and smaller size households. Similarly, higher income HHs consume less of subsistence resources compared to low-income households.
Above-mentioned results indicate that resources and benefits from the Community Forestry Program have not been fairly distributed amongst CFUG. The distribution in ground level contrasts with the stated resource distribution mechanism in the institutional arrangement of the CFP. In addition, the literature also implies that different stakeholders have different interests on the Community Forestry Program that shape their role and influence in decision making and benefit sharing mechanisms. Thus, the study provides inclusive and a participatory management approach, compensatory transfer schemes, and transferable property rights over forest products as the major policy implications to ensure efficient and equitable distribution of resources and benefits in the Baghmara Community Forest.
REFERENCES:


in meetings of the American Association for the Advancement of Science, ‘Science and Technology for Sustainable Well-Being, San Francisco, USA.


Appendix:

Model 1: firewood

```
. reg firewood distance hhsize logIncome loglandholding loglivestock meetingattended
> visittooffice uppercaste lowercaste, robust
```

Linear regression

- Number of obs = 80
- $F(9, 70)$ = 5.34
- Prob > $F$ = 0.0000
- R-squared = 0.3911
- Root MSE = 0.87581

| firewood         | Coef.  | Std. Err. | t     | P>|t|  | 95% Conf. Interval |
|------------------|--------|-----------|-------|------|-------------------|
| distance         | -.7736537 | .2307721 | -3.35 | 0.001 | -.1233914 to -.3133932 |
| hhsize           | .0218734 | .0511632 | 0.43  | 0.670 | -.0801685 to 0.1239152 |
| logIncome        | -.5120227 | .1448067 | -3.53 | 0.001 | -.8009902 to -.2230552 |
| loglandholding   | -.109065 | .1151268 | -0.88 | 0.383 | -.330782 to 0.110681 |
| loglivestock     | .0041174 | .1493186 | 0.03  | 0.978 | -.2936892 to .3019239 |
| meetingattended  | -.1971194 | .2633846 | -0.75 | 0.457 | -.7224233 to .3281846 |
| visittooffice    | -.2057297 | .2196359 | -0.94 | 0.352 | -.6437736 to .2322302 |
| uppercaste       | .0341431 | .3151220 | 0.11  | 0.914 | -.5943443 to .6626304 |
| lowercaste       | .0130254 | .2871616 | 0.03  | 0.984 | -.5597002 to .5857511 |
| __cons           | 7.545078 | 1.336141 | 5.65  | 0.000 | 4.880229 to 10.20993 |

Model 2: grass consumption

```
. reg grass distance hhsize logIncome loglandholding loglivestock meetingattended visittooffice
> office uppercaste lowercaste, robust
```

Linear regression

- Number of obs = 80
- $F(9, 70)$ = 34.64
- Prob > $F$ = 0.0000
- R-squared = 0.7830
- Root MSE = 0.45606

| grass            | Coef.  | Std. Err. | t     | P>|t|  | 95% Conf. Interval |
|------------------|--------|-----------|-------|------|-------------------|
| distance         | -.2883704 | .1400379 | -2.06 | 0.043 | -.5673309 to -.009019 |
| hhsize           | .0641155 | .0218814 | 2.97  | 0.004 | .0210729 to .1071582 |
| logIncome        | .0225609 | .0544496 | 0.41  | 0.681 | -.0861453 to .1310472 |
| loglandholding   | -.0820287 | .0739308 | -1.12 | 0.266 | -.230333 to .0645676 |
| loglivestock     | .877195   | .0866081 | 9.90  | 0.000 | .7004716 to 1.053918 |
| meetingattended  | -.0557882 | .1672025 | -0.33 | 0.740 | -.3892631 to .2776668 |
| visittooffice    | .1131652 | .1171116 | 0.97  | 0.337 | -.1204066 to .3467369 |
| uppercaste       | -.3995311 | .1922301 | -2.09 | 0.041 | -.7809219 to -.0161401 |
| lowercaste       | -.3767083 | .1582707 | -2.38 | 0.020 | -.6923562 to -.0610473 |
| __cons           | -.1080844 | .5668557 | -0.19 | 0.849 | -1.238653 to 1.022464 |
Model 3: participation in Timber consumption (timberp)

```
. reg timberp distance hhsize logIncome loglandholding loglivestock meetingattended visittoffice uppercaste lowercaste, robust

Linear regression
Number of obs  =  80
F(  9,    70) = 1.58
Prob > F      =  0.1370
R-squared     =  0.1415
Root MSE      =  0.49137

|                | Coef. | Std. Err. | t     | P>|t|    | [95% Conf. Interval] |
|----------------|-------|-----------|-------|-------|----------------------|
| distance       | -3.3037 | 1.507137 | -2.83 | 0.007 | -6.059591            |
| hhsize         | -0.015794 | 0.283287 | -0.45 | 0.656 | -0.669179            |
| logIncome      | 0.157937 | 0.721555 | 0.25  | 0.804 | -1.25812             |
| loglandholding | -0.0044968 | 0.052402 | -0.07 | 0.945 | -0.134612            |
| loglivestock   | -0.0694935 | 0.080843 | -0.86 | 0.393 | -0.230729            |
| meetingattended| -0.0403111 | 0.165829 | -0.24 | 0.809 | -0.3725501           |
| visittoffice   | 0.2040807 | 0.1217227 | 1.68  | 0.098 | -0.0386876           |
| uppercaste     | -0.0684304 | 0.1222842 | -0.50 | 0.622 | -0.4230404           |
| lowercaste     | 0.0958462 | 0.1015017 | 0.53  | 0.599 | -0.2663071           |
| _cons          | 0.6200911 | 0.6988585 | 0.89  | 0.378 | -0.7737927           |
```

Model 4: assistance for toilet construction

```
. reg toiletconstruction distance hhsize logIncome loglandholding loglivestock meetingattende

Linear regression
Number of obs  =  80
F(  9,    70) = 4.02
Prob > F      =  0.0004
R-squared     =  0.3152
Root MSE      =  1.849.6

|                | Coef. | Std. Err. | t     | P>|t|    | [95% Conf. Interval] |
|----------------|-------|-----------|-------|-------|----------------------|
| distance       | -1146.01 | 633.6699 | -1.80 | 0.076 | -2413.774            |
| hhsize         | 160.7668 | 115.2419 | 1.40  | 0.167 | -69.0747             |
| logIncome      | -1155.397 | 297.8985 | -3.88 | 0.000 | -1749.537            |
| loglandholding | 114.4063 | 232.8107 | 0.49  | 0.625 | -349.92              |
| loglivestock   | 195.2702 | 267.8948 | 0.73  | 0.468 | -339.0292            |
| meetingattended| 226.4039 | 518.3377 | 0.44  | 0.664 | -807.3881            |
| visittoffice   | -236.5353 | 450.3679 | 0.53  | 0.601 | -1134.766            |
| uppercaste     | 186.4914 | 685.6799 | 0.27  | 0.786 | -1101.054           |
| lowercaste     | 336.7787 | 818.8784 | 0.41  | 0.682 | -1296.423            |
| _cons          | 12994.26 | 2792.233 | 4.69  | 0.000 | 7465.211             |
```
Model 5: Children education

```stata
. reg childedu distance hsize logincome loglandholding loglivestock meetingattended visi > tooffice uppercaste lowercaste, robust
```

| Variable    | Coef.    | Std. Err. | t      | P>|t|     | [95% Conf. Interval] |
|-------------|----------|-----------|--------|---------|----------------------|
| distance    | -0.052619| 0.1425115 | -0.39  | 0.699   | -0.339422            |
| hsize       | 0.039858 | 0.0257652 | 1.55   | 0.126   | 0.011513             |
| logincome   | -1.566392| 0.0597811 | -2.64  | 0.100   | -2.750652            |
| loglandholding | 0.0867921| 0.0537591 | 1.61   | 0.111   | -0.204231            |
| loglivestock| 0.111925 | 0.0671535 | 2.85   | 0.006   | 0.05726              |
| meetingattended | -0.059652 | 0.1288947 | -0.47  | 0.641   | -0.343056            |
| visittooffice| -0.077929 | 0.1067811 | -0.72  | 0.474   | -0.300761            |
| uppercaste  | -0.321837 | 0.1473621 | -2.21  | 0.032   | -0.615791            |
| lowercaste  | -0.361297 | 0.1450651 | -2.49  | 0.015   | -0.650624            |
| _cons       | 1.812889  | 0.537194  | 3.37   | 0.001   | 1.741490             |

Model 6: trainings

```stata
. reg trainings distance hsize logincome loglandholding loglivestock meetingattended visi > tooffice uppercaste lowercaste, robust
```

| Variable    | Coef.     | Std. Err. | t      | P>|t|     | [95% Conf. Interval] |
|-------------|-----------|-----------|--------|---------|----------------------|
| distance    | 0.0449344 | 0.1104155 | 0.41   | 0.685   | -0.175204            |
| hsize       | 0.000791  | 0.0184524 | 0.04   | 0.966   | -0.0360112           |
| logincome   | 0.0086754 | 0.0068327 | 0.28   | 0.779   | -0.1144781           |
| loglandholding | -0.0120012| 0.0560458 | -0.21  | 0.831   | -0.123781            |
| loglivestock| -0.1620365| 0.0729485 | -2.22  | 0.026   | -0.3075266           |
| meetingattended | 0.083858  | 0.0972621 | 0.86   | 0.392   | -0.1101251           |
| visittooffice| 0.1026077 | 0.0916696 | 1.12   | 0.267   | -0.0802216           |
| uppercaste  | -0.1626337| 0.1526597 | -1.07  | 0.290   | -0.4671039           |
| lowercaste  | -0.2228958| 0.1493697 | -1.49  | 0.140   | -0.5280042           |
| _cons       | 0.2400127 | 0.0705044 | 0.34   | 0.735   | -1.166154            |

Number of obs = 80
F(9, 70) = 1.14
Prob > F = 0.3484
R-squared = 0.1314
Root MSE = 0.3888