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合作森林管理实践的综合贡献与可持续性：TILRAKOT

合作森林管理的案例研究，尼泊尔

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COMPREHENSIVE CONTRIBUTIONS AND SUSTAINABILITY OF
COLLABORATIVE FOREST MANAGEMENT PRACTICE: A CASE STUDY
FROM TILRAKOT COLLABORATIVE FOREST MANAGEMENT, NEPAL

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合作森林管理实践的综合贡献与可持续性: TILRAKOT 合作森林管理的案例研究, 尼泊尔

摘要

目前, 在尼泊尔的森林总面积中有超过四分之一的由当地社区进行管理, 基于社区的森林经理 (CBFM) 计划使本国地理区域内的 380 多万家庭受益。因此这些家庭对 CBFM 项目的进一步发展和扩大给予了更多的关注。在全国实行的各项计划中, 合作式森林经营 (CFM) 是第二大的基础计划, 覆盖森林面积超过 6 万公顷, 土地面积超过 60 万公顷, 有 50 万户家庭受益。随着 CFM 计划的成功以及普及范围的日益增加, 本研究尝试以提罗拉科特地区的 CFM 为例, 研究其真实的社会经济情况和对生态的贡献。本研究通过实地观察, 问卷调查和关键信息访谈进行原始数据的收集, 并使用描述性和推论统计对数据进行处理和分析得到二手数据。感知类型的问卷旨在了解人们对 CFM 社会经济贡献的总体看法。此外, 为了评估森林可持续性的 4 级标准, 针对 62 位被访谈者使用了 26 个指标。结合从每位被访谈者口中获得的原始数据, 二手数据, 通过关键信息调查和主要小组讨论的信息处理并分析了调研结果, 为可持续发展的评估提供了标准。结果显示, 提罗拉科特地区 CFM 实践的社会经济和生态贡献显著。同时发现实施 CFM 已经为获益者带来了源源不断的森林产品。通过森林产品获益的家庭数量在过去 5 年中呈上升趋势。CFM 也为当地社区和林业技术人员创造了多个创收机会。此外, 整体可持续发展指数(OSI) 评估显示, 森林目前实现了可持续发展 ($OSI > 0.50$)。然而, 在发展和扩大 CFM 范围并实现其生态目标之前, 仍然存在一些制约因素, 要求管理者对其采取一定措施。因此, 本研究最终提出良好的政策建议, 以期为今后的研究提供借鉴和发展方向。

关键词: 合作森林经营, 感知, 社会经济贡献, 可持续发展指数, 尼泊尔

COMPREHENSIVE CONTRIBUTIONS AND SUSTAINABILITY OF COLLABORATIVE FOREST MANAGEMENT PRACTICE: A CASE STUDY FROM TILRAKOT CFM, NEPAL

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ABSTRACT

Over a quarter of the total forest area of the Nepal is currently managed by the local communities under Community Based Forest Management (CBFM) scheme benefiting over 3.8 million households across all physiographic zones of the country. This large number of households benefited has drawn special attention on further development and expansion of CBFM modalities in the country. Of the various modalities practiced across the country, Collaborative forest management (CFM) is second largest based on the areal coverage encompassing more than 60 thousands hectares forest area and benefiting over half a million households. Owing to the growing popularity and scattered field evidences emanating the success of CFM, we attempted to assess its actual socio-economic and ecological contribution taking Tilaurakot CFM as a case. Data collection involved both primary data collection through field observation, questionnaire surveys and key informant interviews, and secondary data collection which were later decoded, processed and analyzed using descriptive and inferential statistics. The perception type questionnaire designed to find out the overall perception of the people's in socio economic contribution of CFM. Furthermore, to assess the sustainability of forests 4-criteria, 26-indicators and 62-verifiers were used. The gathered information from observation, primary data, secondary data, key informant survey and focus group discussion were compiled and analyzed according to each verifier to provide scores for the assessment of the sustainability. The results revealed that CFM practice in Tilaurakot has made remarkable socio-economic as well as ecological contributions. It was found that the implementation of CFM has generated a continuous flow of forest products to the both near and distant users. The number of households benefitted by the forest product demonstrated an increasing trend in last 5 years of implementation. CFM has also been able to create several income generation opportunities for the local people and forestry technicians alike. Furthermore, the overall sustainability index (OSI) assessment revealed that the forest is on the way towards achieving sustainability (OSI>0.50). Yet, some constraints still remain as barriers demanding prompt response before they amplify and impede CFM from realizing its livelihood and ecological goals. We therefore conclude by providing sound recommendations to the constraints and way forward for future research.

Key words: collaborative forest management, people's perception, socio-economic contribution, sustainability index, Nepal.

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ABBREVIATION

B/C ratio	Benefit cost ratio
C&I	Criteria and Indicator
CBA	Cost benefit analysis
CBFM	Community Based Forest Management
CF	Community Forest (Largest CBFM model in Nepal)
CFM	Collaborative Forest Management (2 nd Largest CBFM model in Nepal)
CFMG	Collaborative Forest Management Group
DFCC	District Forest Coordination Committee
DFO	District Forest Office
DOF	Department of Forest
FY	Fiscal Year
MFSC	Ministry of Forest and Soil Conservation
NPV	Net Present Value
NRs	Nepalese Rupee
OSI	Overall Sustainable Index
SFM	Sustainable forest management
SIIC	Sustainability Index of Individual Criteria
SPSS	Statistical Program for Social Science
TCFM	<i>Tilaurakot</i> Collaborative Forest Management
TCFMG	<i>Tilaurakot</i> Collaborative Forest Management Group
UNCED	United Nations Conference on Environment and Development
US\$	United States Dollar
VDC	Village Development Committee

1 INTRODUCTION

1.1 Background

Forestry developed more than 200 years ago in Europe and Asia to tackle with the scarcity of needed natural resources in the form of wood for building and fuel. It evolved to reflect the full set of ecosystem services that forest can provide over time. It has taken long time and gradual process to reach in the current situation. For the assurance of the ecosystem services by forests such as biodiversity, habitat, recreational opportunities, clean water and wood products management of the forest was perceived as crucial tool. At the most basic level, forestry is about the future and thus management decisions must be based on considerations for both current and future values derived from the forest. Forestry involved a long term perspective, outstanding to the enduring nature by which forests develop from young to mature conditions, a process that can span the careers of multiple foresters (B.S.P., 2012). Forest management deals with the overall administrative, economic, legal and social aspects and with the essentially scientific and technical aspects, especially silvicultural system, protection, and forest regulation. Management can be based on conservation, economics, or a mixture of the two (B.C., 2008). The forest contributes in sustainable economic development of the country by providing various goods and services to the people and industry and also helps in maintaining ecological balance, biodiversity, and socio-economic development of the country. Forest influences local, regional and global climate (Bhattarai, 2006). Forests have a great role to play in the life of rural people in Nepal as it provides fuel wood, timber, fodder and other environmental services to the community. Accordingly, many households directly depend on forests so; the sustainable management of forest is very important to provide big environmental services to the larger community (Adhikari et al., 2004).

In Nepal, Forest covers a total of 5.96 million ha, which is 40.36% of the total land of country. Other Wooded Land covers 0.65 million ha, which is 4.38% as well. Forest and Other Wooded Land together represents 44.74% of the total area of the country (DFRS, 2015). The government of Nepal has been making a number of efforts for the sustainable management of forest in *Terai*¹ (lowlands) of Nepal for not only the economic growth of the nation but also of the local people. These attempts have not been successful to date due to the centralized institutional structure of the forest management administration (Ebregt et al., 2007 cited in Poudyal 2007). After late seventies, it was realized that forests of Nepal could only be saved through active participation of forest users. Then, participatory forest management models, such as community forest and pro-poor leasehold forestry have been launched in Nepal. More than three decades of experience with the implementation of community forestry (CF) have shown that the model is successful in the hills, where forests and people exist together and forests are only used for subsistence purposes.

¹ Terai: Plane and fertile land in Southern lowland region of Nepal.

However, in the lowland (Terai) of Nepal, different situation can be found. Large blocks of highly valuable national forests are found in the North part of Terai regions, while the majority of the population lives in the Southern part. The people living in the Southern part are actually traditional forest users. But by the concept of community forestry program in Nepal, till date, do not accommodate the rights of these distant traditional users. Here, community forestry program can only include the peripheral users and does not fulfill the forest products need of distant users. Therefore, to address the right and demand of distant users and to assure the revenue flows to the both government and local community, this CFM modality has been implemented. Moreover, some effort of the government in order to manage these productive forests was implementing Operational Forest Management Plans (OFMPs). Although OFMPs were technically sound, it could not be implemented due to lack of acceptance and participation of local people. Taking into account these facts, Nepal Government felt the need of policy revision as prescribed by the Master Plan (1989). It was mainly focused for the management of large productive block forests in the Terai region. For this, the government put forward a new participatory concept that is Collaborative Forest management (CFM), mainly for the *Terai*, *Churia*² and *Inner Terai*³ region; and, promulgated the Forest Policy 2000 (MFSC, 2000). The CFM guideline 2011 defines “Collaborative Forest Management as a means of sustainable forest management where forests are managed by government and stakeholders collaboratively according to the approved forest management plan to improve livelihoods, economic opportunities and other multipurpose benefits such as maintaining ecological balance”. In other hand, community forestry program can include the nearby users only, but there are so many societies who don't have nearby forests to consume. This kind of situation is mostly found in Terai regions. Therefore, to include the participation of distant users in forest management for mutual benefits is another interest of this approach.

Furthermore, the main objective of the CFM is to develop sustainable forest management to fulfill the forest products needs and contribute to the poverty reduction agenda by creating employment, maintain and enhance biodiversity and increase national as well as local income through scientific management of block forests (Ebregt et al., 2007). However, to meet the objectives of government in full extent, the traditional way of forest management was not sufficient. By realizing, the District Forest Office, Kapilvastu prepared a scientific forest management plan for Tilaurakot Collaborative Forest in 2009 (TCFMP, 2009). The official meaning of scientific forest management refers to the systematic application of forestry science knowledge for the management of forest, based on the correct assessment of attributes of forest crop, to maximize and sustain the benefits accruing from the forest (MFSC, 2014). Tilaurakot Collaborative Forest Management Plan was considered as the first scientific forest management plan in Nepal. The yield regulation

² Churia: Churia are small hills in Subtropical ecological zone on Nepal, often called Shiwaliks

³ Inner Terai: Plane land across the Churia hills and Mahabharat mountainous range.

of that management plan was based on the Irregular Shelter-wood Silviculture System. However, there were not sufficient policy instruments to implement that kind of scientific management plan in Collaborative Forests. Therefore, Nepal Forester's Association, facilitate the "Ban Chautari: A multi-stakeholder discussion program on forest policy issues" which was held in Kathmandu on July 2011. In that dialogue program all the participants agreed and focused on the implementation of scientific forest management plans in collaborative forests management modality (NFA, 2011). By the result, the promulgation of revised National Forest Policy 2015 has given priority for the implementation scientific management plans in full extent and also focused on the extension of this management concept in Community Forests of Terai. However, it needed regular monitoring and research in this type of management practices either they are achieving their goals regarding socio-economic contribution and sustainability or not.

1.2 Statement of the Problem

Management of *Terai* forests in Nepal has remained unsolved problem throughout its history. In the past attempts in seventies, the forest management practices could not be fully implemented (Sigdel et al., 2005; Baral, 2002). However, later in the nineties, it was realized that the existing forest management practices were unsustainable (Pesonen, 1994; Pesonen & Rautiainen, 1995) to manage the Terai forests. After that, in next attempt Forest Management and Utilization Development Project (FMUDP) was launched by the support of Finnish International Development Agency (FINIDA). FMUDP mainly prepared operational forest management plans (OFMPs) for five districts of Terai (Bara, Parsa, Rauthat and Makwanpur). These OFMPs were technically sound and sustainable (Poudel, 2007; Bampton, et al., 2007), though, they could not be implemented mainly due to the lack of cooperation from local community. other stakeholders and inadequate focus of central government including policy barriers like ban on green tree felling (Baral, 2002).

In the past, no scientific management of Terai forests was done except few silvicultural demonstration plots (Parajuli & Amatya, 2001). Therefore, the condition of growing stock is deteriorating resulting in the preponderance of old stock with very low growth than the potential growth and even good seed producing trees are scarce (Pesonen et al. 1995). As a result of this, nation is producing 30 times less timber than the potential level of production (Sah et al., 2004; Hill, 1999). Thus, large amount of timber, government royalty and subsequent employment opportunities are foregone every year (Subedi, 2013). CFM is supposed to address the above problem of scientific management of Terai block forests (MFSC, 2000; MFSC, 2003; MFSC, 2011).

The failure in the implementation of OFMPs and other government management of Terai forests led to the realization of the necessity of some form of people's participation in forest management (Kanel, 2000; Pokhrel, 2000; Shrestha, 2000). Although CF has led to improved forest protection in Terai (Bampton et al., 2004), around 85% of Terai population particularly distant users are being excluded from the CF (Bampton &

Cammaert, 2006; Ebregt et al., 2007; Sigdel et al., 2005). Community forestry programme in Terai is unable to scientifically manage large block of valuable Terai forests (Sigdel et al., 2005) and it is also inequitable in terms of access to and benefit sharing from Terai forests (Bampton & Cammaert, 2006) particularly to the geographically more distant and traditional users (Ebregt et al., 2007; K.C., 2005; Bampton et al., 2004). Community forestry was aimed at fulfilling basic needs of forest products of local people (MFSC, 1989) and therefore all the management inputs so far are subsistence and protection oriented which neglects professional inputs necessary for scientific sustainable forest management and emphasizes only organizational aspects of forestry (Donovan, 2001). Terai forest was the main source of revenue in the before, it caused the drop off national revenue from Terai districts with the handover of some Terai forest to the Community Forest User Group (CFUG). There is loss of NRs 5,390 per hectare per year from non-scientific management of terai forests (Hill, 1999). Existing management practices in all types of forest are now silviculturally (biologically) unsustainable (Subedi, 2012).

Collaborative forest management is a working partnership among the key stakeholders in the management of given forest-the key stakeholders being local forest users, state forest agencies and local governments, Non-government Organizations (NGOs), civil society organizations and private sector (Carter & Gronow, 2005). In view of controversy and inappropriateness of CF in Terai an urgent need of scientific management of Terai block forests with the participation of local users including distant users who remained excluded from CF, GoN introduced the policy of collaborative forest management (MFSC, 2000; MFSC, 2003; MFSC, 2011). CFM is aimed at managing Terai block forests in a silviculturally sustainable and scientific manner to produce maximum forest products with the participation of local stakeholders and create equitable access to forest resources by the mechanism of including distant user who otherwise remained excluded.

Though CFM has been initiated since 2005 and implemented in 9 districts and 21 groups have been registered; scientific forest management programme has been started first in Tilaurakot CFM in Kapilvastu district recently in 2011. This programme has been recently initiated in Rupendehi, Kailali, Morang, and Nawalparasi district other districts. In other hand, Ministry of Forest and Soil Conservation (MFSC) has envisioned “Forestry for Prosperity” from 2012 and focusing on the implementation of scientific forest management for prosperity of nation but it requires much more consciousness, technical effort and understanding among forest users (MFSC, 2014). Moreover, the recent forest policy 2015 has focused on scientific management of forests. The government wants to expand this concept also in the community forests. Due to lack of knowledge and information about opportunity and challenges of scientific forest management, it is very difficult to expansion and implementation in other CFM and also in Community forest (Bhattarai, 2015). Itself, very few studies have been conducted on collaborative forest management in comparison to community forestry. Therefore, for the expansion of current management practices in

collaborative forest management, it is obligatory to study about its socio economic contribution and sustainability. Either this management practice is suitable for achieving predefined goals or not. Thus, this study has aimed to explore the ground reality of current management practices regarding socioeconomic contribution and sustainability as well as the overall perception of the peoples towards collaborative management practices.

1.3 Research Questions

Though the collaborative forest management concept has been developed since 2000, the implementation started in 2005. However, the concept of intensive, technical or scientific forest management was started in 2011 by this collaborative forest. Therefore, this study was designed to explore the socioeconomic and environmental contributions and its sustainability index as well as the people's perceptions regarding this type of management practices. The study was conducted using following research questions in the study area:

- a) What are the socio-economical and environmental opportunities provided by the CFM practice?
- b) How does CFM practice contribute in socio-economic development and environmental enhancement?
- c) How do people perceive the CFM management practices in the study area?
- d) Is this practice is Sustainable? And, what are the areas to be improved?

1.4 Objectives of the Research

The general objective of the study is to explore the socioeconomic and environmental contribution of current CFM practices and its sustainability. To achieve this general objective the following specific objectives has been formulated:

1. To evaluate the socio-economic and environmental contribution of collaborative forest management practices in the study area.
2. To assess the people's overall perception toward existing CFM practices in the study area.
3. To measure the sustainability of CFM by using sustainability index.

1.5 Significance of the Study

Collaborative forest management regime is a major priority program of Department of Forest in which so-called scientific forest management practices are being implemented for the sake of sustainable management. The government wants to expand the implementation of this kind of management practices not only in Collaborative Forests but also in Community Forests of Nepal. Therefore, Comparative study on traditional forest management and scientific forest management based on their management plan of the same forest has been also adopted in this study. There may be very few studies were conducted about socio-economic contributions of the CFM practices and its sustainability index at the real ground. Hence, the findings of this study was supportive for the forestry

policy makers, Department of Forest, District forest office, Tilaurakot CFM and other stakeholders to understand the real ground figure which ultimately will be helpful in further policy making, planning and decision making process.

1.6 Limitations of the Study

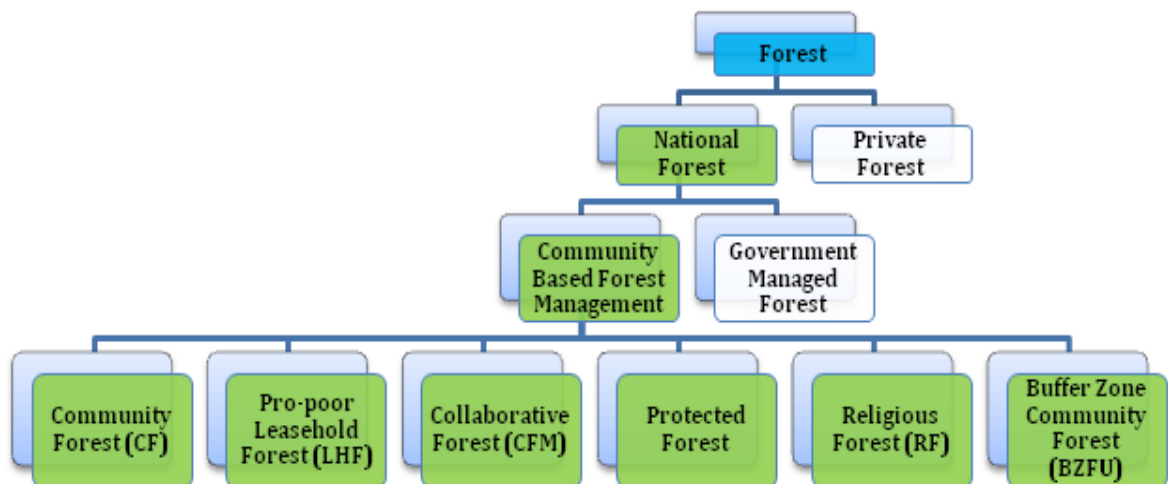
This was a case study on a single Collaborative Forest due to limitation of time and funding, therefore, all the findings of this research may not necessarily represent the regional and national scenario but the result can be used as a base line scenario for further research. Though, the selected criteria and indicators for sustainability index are adopted from Pokherel et al. 2013, which seem to be well-matched for the context of Nepal, do not address the present global issues of changing climate and its impact on different aspects. Moreover, the study of socio-economic contribution was done in explorative and descriptive form; it was unable to measure the exact figure of the contribution with respect to the situation before the CFM plan implementation because of lacking in baseline data. This study was based on information collected from key informant interview, compilation of secondary data available in TCFM group and DFO and questionnaire survey for analyzing the people's perception on CFM practice. Therefore there may be some limitations; however, this study may be the baseline for further study.

2 IMPLEMENTATION STATUS OF CBFM & LITERATURE REVIEW

2.1 Community based forest management (CBFM) in Nepal

2.1.1 Types and Status of different CBFM modalities

On the basis of management regimes Nepal's forests are broadly categorized in Private Forest and National Forest. Private forests are those which are in private land of individual people, any private company or institutions. However, the National Forests include all other forested lands except the private forests. It is further divided in different management regimes with different tenure system and varied property rights. Talking about the community based forest management (CBFM) approach in Nepal; there are six different types of CBFM modalities to meet different objectives with varied tenure arrangements. Among these all modalities community forest is most popular not only locally but also the globally. However, only community forest modality is not alone sufficient to deal with the desires and needs of all kind of people (Pathak et al, 2017). Therefore, the government of Nepal has commenced six different kinds of CBFM modalities (Fig. 2-1).



Source: adopted from Pathak et al., 2017

图 2-1 尼泊尔不同的 CBFM 方式

Fig. 2-1 Different CBFM modalities in Nepal

The recent national data shows that altogether 2.3 million hectare forest that is 38.5% of total forest land of the country is being managed by the local community in Nepal. It involved 3.8 million families under the different model of community based forest management. This vast number of households benefited has also brought special attention on further development and expansion of community based forest management modalities

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in Nepal. The current status of different modalities is shown in Tab. 2-1. Furthermore, Forests of Nepal occupies 5.95 million hectares that is 40.36% of country's land (DFRS, 2015). Therefore, the CBFM practice covers 38.5% of total forest involving more than 3.8 million households.

表 2-1 尼泊尔不同 CBFM 的现状

Tab. 2-1 Status of different CBFM in Nepal

SN	CBFM Modality	Number	Area (Hectare)	Involved Households	% of Total CBFM area
1	Community Forest	18,324	1,717,811	2,260,688	74.79
2	Collaborative Forest	23	60,588	553,262	2.64
3	Pro-poor Leasehold Forest	7,419	42,735	75,021	1.86
4	Protected Forest	8	133,685	275,124	11.98
	Protected Forest Proposed	8	141,439		
5	Religious Forest	36	2056	-	0.09
6	Buffer zone Community Forest	677	198,550	677,000	8.64
	Total	26,487	2,296,864	3,841,095	

Source: Adopted from Pathak et al., 2017

2.1.2 Tenure arrangements in different CBFM modalities

As a result of the reviewing related acts, regulations, policies, and guideline of Nepal, the compiled information about legal definition and tenure arrangement of the different CBFM model in Nepal are briefly described in Tab. 2-2.

表 2-2 不同 CBFM 模式下的概念界定与保有制度

Tab. 2-2 Definition and tenure system in different CBFM model

Forest Management Modality	Tenure Arrangement
<p>i. Community Forest: part of the national forests handed over to forest user groups for development, conservation and utilization in the interest of the community</p>	<ul style="list-style-type: none"> • Tenure period is not limited by law; management is regulated usually by 5-10 years management plan after approval by District forest office • Recognizes traditional use rights and access. • Users have rights to make plan, fix rate and sell forest products • Only the surplus forest product, after fulfilling the need of local user group, can be sold outside.
<p>ii. Collaborative Forests: National forest manages in collaboration with local people, local government and Department of forests.</p>	<ul style="list-style-type: none"> • Management Tenure is unlimited; management is defined through a 5-10 years Management plan. • Benefit sharing: 50% user group, 40% District forest office and 10% local government. • It also includes the distant users • User group have to satisfy the need of user group at first and surplus products can be sold outside.

<p>iii. Pro-poor leasehold forest: National forest handed over to a group of local poor HHs for mainly to improve their livelihood.</p>	<ul style="list-style-type: none"> • Tenure period is 40 years, can be extended for another 40 years. • Use right only, land ownership remains with Government. • Users are not allowed to harvest existing trees before hand over; however, they can harvest and sell any product planted by them. • Only degraded forest land is handed over to the ultra poor household.
<p>iv. Religious forest: National forests that have been entrusted to any religious entity, group or community.</p>	<ul style="list-style-type: none"> • Tenure is unlimited; management is defined through 5- year plan. • Reorganization traditional use rights required. • Sale of forest products for commercial purpose restricted. • Forest is used for religious purpose only.
<p>v. Protected forest: National forests that has been declared protected considering their environmental, scientific and cultural importance</p>	<ul style="list-style-type: none"> • Management is defined usually through 5-10 year plan. • Limited user right is given to local community mainly focus on protection of special feature of that forest. • Government and line agencies implement subsidy programs like alternative energy, support for private forest, eco-tourism development etc.
<p>vi. Buffer zone (BZ) CF: This is the Forest outside the core area of National parks and wildlife reserves managed by local community as community forest.</p>	<ul style="list-style-type: none"> • Community can harvest and use their forest product for their own use only and there is no authority to sell timber in outsiders. • 30 to 35 percentage of income of the National Park and Wildlife Reserves from tourism goes to the welfare of BZ management committee.

(Compiled from related acts, regulation and guidelines under MFSC, Nepal)

Source: Adopted from Pathak et al., 2017

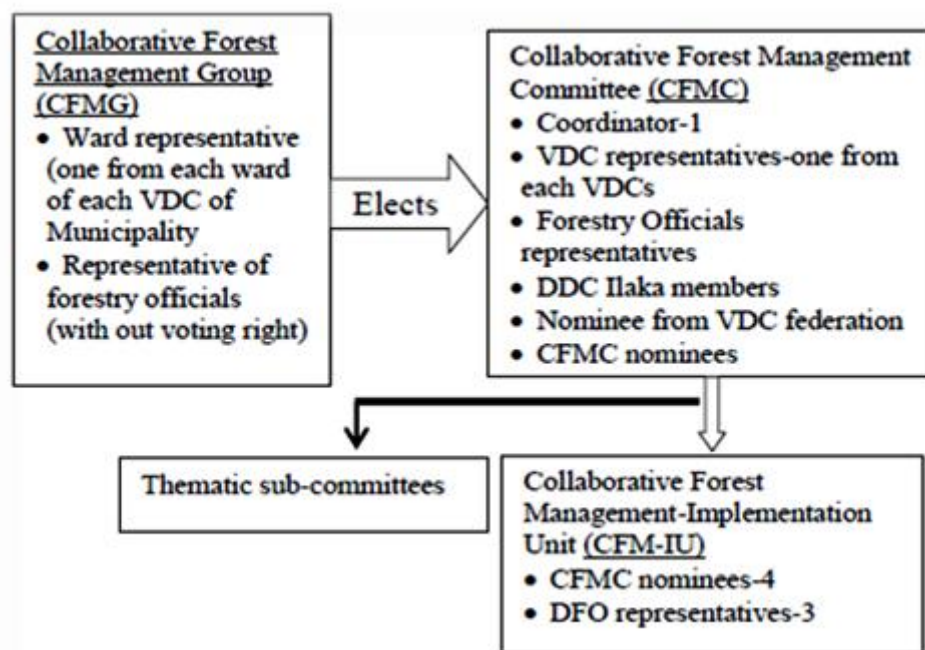
2.1.3 Collaborative Forest Management (CFM) and its Structure

CFM is one of the important community based forest management models in Nepal that is mainly implemented in comparatively large blocks of forest in the southern low land of Nepal. Simply, it is a partnership between local people, local government and central government (MFSC, 2011; MFSC, 2015). This partnership works through a stakeholder group organization with a three-tier institutional structure based on stakeholder membership. The CFM structure includes:

- I. **CFM group (CFMG)** is the main decision-making body and includes the representatives of the beneficiaries/stakeholders, consisting of unanimously elected ward representatives from proximate and distant users. This group can represent the each ward number of every VDC. It has right to elect the CFM executive committee.
- II. **CFM committee (CFMC)** is elected body by the CFM group as a executive community for the principal day-to-day decision making and work. It can be formed by representing the users, local governments and central government. CFMC acts as the board of directors in the matters of CFM.
- III. **CFM implementation unit (CFM-IU)** consists of 7 members out of which four are nominated by CFMC and three are deputed by District Forest Officer

(DFO). The CFM-IU serves as the secretariat of CFMC and performs all day-to-day work related to CFM on behalf of CFMC.

CFMC can formulate various sub-committees as need for any special activities requiring specific functions such as forest product (FP) distribution sub-committee, thinning monitoring sub-committee etc. The organizational structure of CFM is presented in Fig. 2-2.



Source: MFSC, 2011

图 2-2 CFM 的组织结构

Fig. 2-2 Organizational Structure of CFM

CFM has a strong element of incorporating distant users as active stakeholders and beneficiaries in the management and sharing of benefits from the forest. Under the CFM modality, benefit-sharing arrangements ensure that the natural resource base in the Terai also supports the district and national governments, and not only the CFM group. It is designed with in-built institutional arrangements and processes that support scientific forest management, which should generate substantial local employment. It promotes income-generating activities, both within and outside the forest.

2.2 Literature Review

2.2.1 Concept of Collaborative Forest Management (CFM)

The CFM Working Group (2003) constituted by MFSC defined CFM as ‘an approach of sustainable forest management in collaboration with the local people to achieve multiple benefits, maintaining ecological balance, generating economic returns and improving livelihoods from the government managed forests,’ and the intention of CFM in Nepal goes further in terms of stakeholder involvement and (fiscal) decentralization than joint forest management (JFM) in India. Moreover, The CFM guidelines (MFSC, 2003) defines CFM as ‘management of government owned forests in collaboration with Government of Nepal (GoN) and stakeholders in consonance with the approved forest management plan for the livelihood improvement and achievement of multipurpose benefit including economic benefits and maintaining ecological balance of the forest.

Furthermore, Carter and Gronow (2005) have defined CFM as "a working partnership between the key-stakeholders in the management of a given forest", the key stakeholders being local forest users and state forest departments as well as civil groups and non-government organizations, and the private sector. Cornwall (1996) and Borrini-Feyerabend (1997) argue that the term partnership is less ambiguous than the 'participatory approach' (cited in Carter & Gronow, 2005). Further, Berkes (1997) emphasizes the importance of equitable partnership drawn upon the complementary strengths of forest department and local users and it implies that each partner takes on the responsibilities and shares rewards based on the clear understanding and respect for the other partners' rights and entitlements (cited in Carter & Gronow, 2005).

The principal objectives of the collaborative forest management is to develop sustainable forest management to fulfill the need for forest products, contribute to the national agenda of poverty reduction by creating employment, maintain and enhance biodiversity and increase national and local income through active management of the Terai and Inner Terai forests (Ebregt, et al., 2007)

2.2.2 Need of CFM in Terai and Inner Terai

Revised forest policy 2000 introduced a new forest management modality as CFM for contiguous large blocks of productive Terai and Inner Terai national forests. There are some reasons for developing CFM in Terai and inner Terai of Nepal.

The full potential of the Terai forests is perceived as not being realized through the existing forest management modalities (either CF or government-managed forests) despite various attempts of scientific management in the past (Baral, 2002). The failure of OFMPs and government management led to the recognition of need of people's participation in forest management (Kanel, 2000; Pokharel, 2000; Shrestha, 2000). CFM aims to increase productivity through appropriate professionally managed silvicultural interventions and sustainable forest management of large block forests to fulfill the need for forest products

and conserve biodiversity, while contributing to poverty reduction through employment generation with the involvement of local people and stakeholders (Ebregt, et al., 2007) and the provision of firewood, fodder and small wood for collaborating communities (MFSC, 2000).

The Community Forest (CF) Program in the Terai is alleged to be unable to manage the forests scientifically (Sigdel, et al., 2005 and Subedi, 2012), as well as being inequitable in terms of access to and benefit sharing from Terai forest resources (Bampton & Cammaert 2006; NORMS, 2002), particularly to the geographically more distant and more traditional Madhesi users (Ebregt, et al., 2007; Sigdel, et al., 2005; Singh KC, 2005; Bampton, et al., 2004; Skarner, 2000). Around 85% of the population, particularly southern distant users, is practically being excluded from the CF programme (Bampton & Cammaert 2006; Ebregt, et al., 2007; Sigdel, et al., 2005; Singh KC, 2005; Bampton, et al., 2004). CFM aims to address the issue of people settled in the southern part of Terai as distant users.

The current CF programme reaches only 16% of the Terai population (mostly proximate users), and many proposed new community forestry users' groups (CFUGs) also do not incorporate distant users. This has led to violent conflicts between distant and proximate users occasionally (Shrestha, 2000). Therefore, a mechanism to ensure the inclusion of the distant users and their access to benefits from forests in managing Terai forests is necessary (Sigdel, et al., 2005; Singh KC, 2005).

One of the principal aims of CFM is to ensure participation of local governments, which are bypassed by the CF (Sah, et al., 2004; Sigdel, et al., 2005). At same time, the government is losing huge revenue every year from the national asset i.e. forest for leaving unmanaged (Ebregt, et al., 2007; Singh KC, 2005; Sah, et al., 2004; Subedi, 2012). CFM is therefore designed to include both central and local government units as stakeholders in the management of Terai forests, in both management and benefit-sharing.

2.2.3 Benefit sharing mechanism of CFM

The benefit sharing mechanism has two aspects in CFM practice, first one is benefit sharing between different partners (Central Government, Local Government and the CFM user group) and another is within the group (amongst the households of same user group). As it is a new program, the mechanism for benefit sharing has been reforming on the basis of learning by doing process. According to Singh (2014), the benefit sharing system within the group is mainly based on equality that is not much satisfied by the most of users. Moreover his study has shown that about 52% respondents were found to be completely against the existing decision-making and benefit sharing mechanism. Similarly, 47% users are also satisfied with the current fund mobilization system (Singh, 2014). The main source of income in CFM is marketing of forest product, assistance from District Forest Sector Co-ordination Committee (DFSCC)/ District Development Committee (DDC) and DFO/MFSC, donation. Based on production and quality (grading) of timber and firewood;

50% amount is allocated for Collaborative Forest Management Group (CFMG) and rest 50% amount is for Government of Nepal (10% to the local government and 40% to the central government) (MFSC, 2016a). Forest products are provided to users through CFM committees' decision. For the sell and distribution of these forest product derived from the forest management activities; committee have to give first priority for the fulfillment of internal demand and then rest amount can be allocated for external demand through auction for commercial purposes. Auction of the forest products was made only in case there is surplus of the forest products in CFM. Forest products selling rate will not be less than the government's royalty rate. But a provision of free distribution or nominal price for fodder, lops and tops and small timber obtain from forest management operation to the users as per decision from CFMG. Additionally; Non Timber Forest Products (NTFPs) can be sell/distribute according to the decision of CFMG for personal or commercial purpose. Income of CFM from forest product selling was allocated 10% for daily functioning and administration works, 40% for forest management works according to forest operational plan (scheme) and rest 50% amount is for poverty alleviation, community development and social development (MFSC, 2016a).

2.2.4 Legal provisions and reforms related to CFM

a. Master Plan for the Forestry Sector (MPFS, 1989)

The Master Plan for the Forestry Sector was prepared during 1986 to 1988 and finally approved in 1989 that envisioned policy and planning framework of the forestry sector for 25 years. There were mainly four long-term objectives of the MPFS that is given as following:

- to meet the people's basic needs for forest products on a sustained basis
- to conserve ecosystems and genetic resources
- to protect land against degradation and other effects of ecological imbalance
- to contribute to local and national economic growth

During that period the forestry development programs were guided by this MPFS with the comprehensive structure of few primary and supportive programs. Those all programs had mainly followed the wider principles of people's participation and decentralization. Among its primary programs, National forestry and Leasehold forestry was one of the prioritized programs. Further, MPFS had emphasized sustainable (scientific) forest management with clear cut targets.

b. Revised Forestry Sector Policy 2000 (MFSC, 2002)

In 2002, Government of Nepal has introduced Forestry sector policy to tackle with the depletion of forest resources as well as to improve the conservation status by practicing sustainable forest management. The main coverage of that policy includes the following:

- Contiguous and large patch of forests of Terai, inner Terai and Churia hills will be delineated, declared and managed as a government managed national forests,

- A collaborative forest management system, following natural processes, will be applied to improve forest and biodiversity,
- Since the present timber stock in Timber Corporation of Nepal and the collection of fallen trees from forests and settlement areas is able to meet the present demand, therefore, green trees are not allowed to cut down in normal condition.
- In Terai, the isolated and barren forest land should be made accessible for handing over as community forests to the local users.
- However, in Churia (Shiwalik) hills it will be managed as a protected forest.
- It was realized the importance of people's participation for the sustainable management of Terai, the Churia and inner Terai forest. To increase the participation, committees will be established for distribution of fuel wood and fodder in free of cost and the provision will be made such as of 50% of the income or forest product (firewood and timber) from CFM should be given to the local community. The remaining 50% of income or forest product will be collected as government revenue.

c. Five year plan 2003-2007 (NPC, 2003)

The Tenth Five Year Plan 2003 - 2007 includes CFM related targets. The plan mentions that "CFM plans shall be prepared and implemented in eleven Terai and Inner Terai districts with the full participation of local people (through CFMG) in planning, decision making and benefit sharing".

d. CFM Guidelines (MFSC, 2003)

On the basis of the Forestry Sector Policy 2000, the GoN introduced the Collaborative Forest Management Guidelines in 2003. This directive is used for managing government managed forests (GMF) of the Terai and Inner Terai. CFM is an alternative management model for GMF, an approach that was catered for in the 1993 Forest Act. The act mentions that the Department of Forests shall prepare and implement management plans for GMF. Later in 2011, the guidelines were revised. Major changes are in benefit distribution that it is apportionment of FPs in equal quantity between GoN and CFMG as against the older provision of revenue sharing of 75% and 25% by GoN and CFMG respectively. Further, the local government's exclusive share of revenue was omitted and in place of it new provision mentions only the share of CFMG and GoN, leaving the local governments share dependent on the negotiation between CFMG and local governments.

e. Scientific Forest Management Procedure 2014 (MFSC, 2014)

Scientific forest management procedure has provided a common understanding to implement scientific forest management. Forest act 1993 has categorized national forest into: Community forest, Religious forest, Leasehold forest, Government managed forest and Protected forest. In addition, government managed forest is managed jointly by local people, central government and local government as collaborative forest. Condition of

forest in Terai is degraded day by day due to lacking appropriate management and also facing problem of forest product supply due to low production. So it is needed to implement scientific forest management in Terai forest immediately. Scientific Forest Management is the systematic application of forestry science knowledge for the management of forests based on the correct assessments of attributes of forest crop to maximize and sustain benefits accruing from the forest. Scientific forest management essentially follows particular silvicultural system.

f. Forest Policy (Revised) 2015 (MFSC, 2015)

Recently revised Forest Policy (2015) has focused on altogether on six different models of community based forest management in Nepal. It has also given priority to the so called scientific forest management by preparing scientific forest management plan mainly in CFM program and Community forests program. Previously, the concept of scientific forest management plan was only in CFM program. Furthermore, it has also focused on community development, social inclusion and women participation through CBFM program for the sake of achieving sustainability of the forest.

g. Forest Act 1993, Amendment 2016 (MFSC, 2016a)

This recently approved amendment has clarified the modality of CFM program in Nepal. It has provided the legal space for the implementation of CFM program by incorporating its provisions into the prevailing forest act. Because, there wasn't any specific provision about CFM in the prevailing forest act. It has also made apparent about benefits sharing mechanism between government and local community. For instance, total production of timber and fuel wood is divided in three parts proportionally. Among that 50% quantity of timber and fuel wood goes to User group, 10% goes to Local Government and 40% goes to Central Government.

h. Forestry Sector Strategy, 2016-2-15 (MFSC, 2016b)

This is also recently made strategic national document to achieve the sustainable development goal through the sustainable forest management practice in Nepal. This strategy mentioned strategic view for the forest management and mainly focused on scientific forest management of CFM and other CBFM modalities. At the moment, CFM is a focal management modality for the scientific forest management to fulfill the country's demand for timber by implying particular silviculture system for the yield regulation.

2.2.5 Consequence of Scientific Forest Management in CFM

The experiences from India have shown many achievements and successes of this policy on 'scientific forestry'. The forest revenue has gone up from around Indian Rupees 150 million in 1947 to around IRs. 4.7 billion (Indian rupees) in 1980, the Government has taken over almost all forest lands and the extent of reserved forests has gone up from around 100 thousands square miles in 1947 to over 150 thousands square miles by 1976-77, the rapid increase in the forest area totally closed to grazing, etc. The most disastrous effect

of this policy was the more or less complete destruction of all the traditional forest-based industries (Mackenzie, 1983)

Potential sustained yield of Nepal's forest would be 3.1975 million m³ (in slight growth scenario). After excluding the fragile Siwalik region the adjusted total yield would (in slight growth scenario) be 2.6 million m³ per year. In the same scenario potential annual revenue (considering NRs 400 and 150 per cubic feet for *Shorea robusta*. and others respectively) would be NRs. 29,242,500,525 (Nepalese rupees). Direct employment created from harvesting and logging only was 41,000-82,000 persons per year. The forest sector could not be compared economically with other sectors if environmental services are not considered. It is promising that only the timber and fuel wood can contribute largely (5.7%) to national GDP (NFA, 2011). The management should not only be timber centered rather it should also consider ecosystem services, ecotourism and other products as per users groups desire. Consequences of not adopting scientific forest management are; deteriorating forest condition, short supply of timber, loss of revenue (about Rs. 28 billion per year in most likely scenario), damage to the resources in other place, large employment opportunity foregone, transfer of land to other uses and deviation of issue from forestry into social issues and contestation and lack of trust (Subedi, 2012).

There is need of addressing drivers of deforestation for effective scientific forest management. Institutional reform, investment in increasing accessibility, harmonization of donor funding, training and orientation to DFO staffs as major requirement for scientific forest management in Nepal. Trans-boundary leakage, conservative mind of policy makers to approve management plans, governance as some of the obstacle for scientific forest management (NFA, 2011).

2.2.6 Sustainability assessment of Forest Management

i) Concept of Sustainable forest Management

Sustainable development concept was elaborated by the World Commission on Environment and Development in 1987, and endorsed by the United Nations Conference on Environment and Development (UNCED) in June 1992. Since then, it has become the most important issue in the development aspirations of the 1990s. This concept activated the review of traditional forest management systems, by which degradation and deforestation was continuously being happened. (Kashio, 1998).

Moreover, Sustainable forest management (SFM) has been described as forestry's contribution to sustainable development that is economically viable, environmentally sound and socially beneficial. Furthermore, it can fulfill the demands of upcoming generations. SFM is considered as one of the most significant contributions which the forestry sector can contribute to the sustainable development objectives of any economy, mainly those richly endowed with forest (FAO, 2000). The concept of sustainable forest management does not relate exclusively to forest as ecological systems, but to forest as

human influenced environments that are in many respects subordinated to the socio-economic environment (Weirsum, 1995).

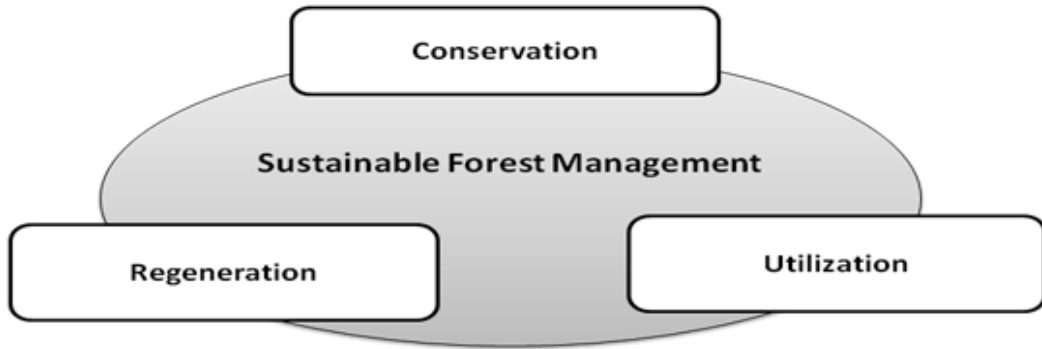


图 2-3 传统的森林可持续性概念

Fig. 2-3 Traditional concept of sustainability of forest

Consequently, the norms for sustainability in forestry may relate to both ecological and social characteristics, as well as to the reciprocal relations between these categories. Hence, attainment of SFM ultimately depends upon the understanding of different social values with respect to forest resources (Weirsum, 1995). In this regard, CBFM has played important role towards achieving the sustainable management of forest resources focusing both social as well as ecological issues. SFM is the forestry component of sustainable development for which there are many definitions in forestry Science. According to ITTO (2005), SFM is the process of managing permanent forest land to achieve one or more clearly specified objectives of forest management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment. Using the above definition, we can represent the interaction of the three functions economic, environmental and social, in the following way:

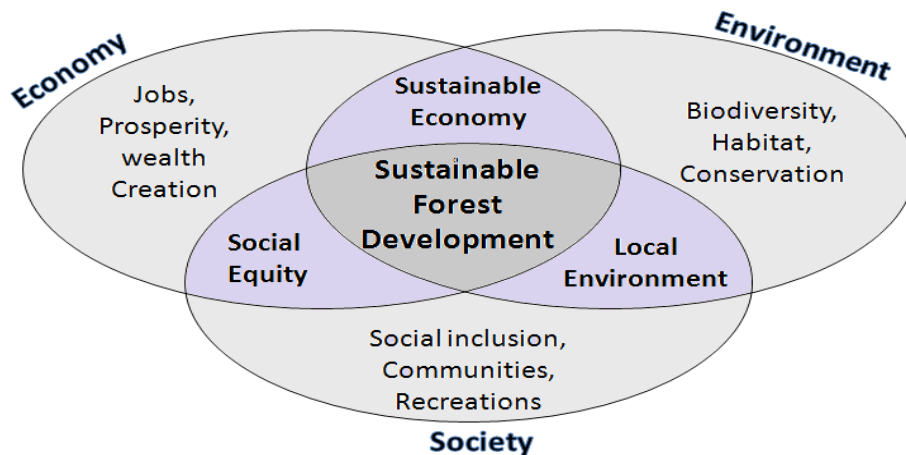


图 2-4 可持续森林管理: 国际框架 (FC-UK, 2002)

Fig. 2-4 Sustainable Forest Management: The International Framework (FC-UK, 2002)

Sustainable forest management is the forestry component of sustainable development. There are various definitions and they all state fundamentally the same such as: sustainable forest management is the process of managing forest to achieve one or more clearly specified objectives of with regards to the production of a continuous flow of desired forest products and services. Moreover, a sustainable forest is one, which is able to meet the goals of forest management forever. Broadly, management goals can be categorized into economical, social and environmental sectors. Management of a forest for a single goal or product will affect the forest's ability to provide other services or products, so trade-offs have to be made. Sustainable Forest Management is generally accepted as the production of a range of goods and services from the forest, without degrading the forest's ability to provide further goods and services in future. This is the policy guideline of sustainable forest management; however, it must be further described to make it applicable within international and national frameworks.

The local communities residing in and around forest areas have their own understanding of forest management. The indigenous knowledge of these traditional societies can be utilized to sharpen the capacities of real actors of SFM by providing technical need-based training. Institutionalization of the working group could be a viable option for suitable management of forests (Kotwal et. al., 2008). The concept of sustainable forest management is important in collaborative forest management in order to maintain ecosystem, to improve livelihood of rural people and to enhance social capital. Therefore, sustainable management of collaborative forest modality must evidently improve and generate the local economic benefits to the satisfactory levels and also balance the opportunity costs acquired by SFM.

ii) Sustainability assessment

Sustainability assessment can be explained as a tool to measure the effectiveness of the implemented management approach to achieve the goal. It can show either the implementation is going on well or worse. However, verification of effectiveness requires specification of the criteria suitable for the defined goals, objectives and actors involved. Several methods have been developed and tested to assess changes by different authors. Development of Criteria and Indicators (C&I) has helped to develop significant tools for assessing trends in forest condition and forest management. C&I provide a common framework for describing, monitoring and evaluating progress towards sustainable forest management (Prabhu, et al., 1998). Therefore, current efforts for the development of C&I for sustainable forest management (SFM) reveal a increasing recognition that human interventions can endorse the sustainability of forest (Poteete & Ostrom, 2002).

The International Tropical Timber Organization (ITTO) introduced the C&I concept and terminology in 1992. Since then several organizations and professionals have worked together upon for generating and testing appropriate C&I to suit their own condition. Some

important institutions working on international level are Forest Stewardship Council (FSC), Centre for International Forestry Research (CIFOR) and Regional Community Forestry Training Centre (RECOFTC). Principles, C&I are the three main conceptual tools constituting the important components of the C&I framework.

Principles, Criteria and Indicators

Principles: Principles are the fundamental truth or law as the basis of reasoning or action. Principles regarding SFM are seen as providing the prime frame for managing forests in a sustainable manner (Mendoza, et al., 1999).

Criterion: A criterion is “an aspect that is considered important by which sustainable forest management may be assessed” (ITTO, 1998). The criteria constitute a set of key elements that define the scope of the concept of sustainable forest management. They are standards against which progress towards meeting the principles can be judged. Furthermore, criteria can be described as essential elements by sustainability can be assessed. That can keep attention to the protective and productive roles as well as social roles of the forest ecosystems. Each criterion relates to a key element of sustainability, and may be described by one or more indicators.

Indicator: An indicator is “a quantitative, qualitative or descriptive attribute that, when periodically measured, indicates the direction of the change” (ITTO, 1998). Indicators are the components or variables of the forest or management system that imply or indicate the state or condition required by criterion (Ritchie, et al., 2000). They measure and help to monitor the status and changes of forests in quantitative, qualitative and descriptive terms that reflect forest values as seen by those who define each criterion.

Verifiers: Verifiers are the data or information needed for assessing an indicator (Ritchie, et al., 2000). They define the specific details that would show whether an indicator is met. The use of ‘criteria and indicators’ have become widespread as a means to help monitor, evaluate and develop policies. Several countries are actively participating in one or more on-going initiatives for the development and implementation of criteria and indicators. Some of these initiatives are: ITTO, International Union of Forest Research Organizations (IUFRO), CIFOR, Pan-European Forest Process and Montreal Process. Criteria and indicators help building bridges between stakeholders in the forestry domain. They are useful in informing policy makers and in communicating with the public. In turn, this information plays as an instrument to influence policies and decisions to achieve Sustainability of Forest (FAO, 2008). C&I are the tools that can be used to define, assess and monitor timely progress towards SFM in a specified forest area, over a time period.

Hence, the ultimate aim of C&I is to promote improved forest management practices over time, and to contribute the development of a healthier and more productive forest estate, taking into consideration the social, economic, environmental, cultural and spiritual needs of the full range of stakeholders.

Importance of Criteria and Indicators

C&I for SFM comprise a proficient structure to help countries to collect, store and disseminate reliable and scientifically based information on forests. This can help to improve the weakened indicators or area for achieving SFM goal.

There are limited literatures dealing with the criteria and indicators of Sustainable Forest Management in Nepal. Poudel (2002) and Dhungana (2009) studied sustainability of community forest management using criteria and indicators but the findings are mainly related to social and institutional aspects. Nepal has developed specific criteria and indicators at the national level for community forest management and forest user groups, but these criteria and indicators are not yet organized and applied in a systematic manner (FAO, 2000). Recently, Pokharel et al. (2014) have done study of sustainability of three different types of CBFM modalities in Nepal, by using the C&I developed by Pokharel et al. (2013). For instance, here is some essential model criteria for SFM mentioned by Kanel & Acharya (1999) as following:

- Forests which are protected and managed by the users themselves,
- Forests which are able to fulfill the subsistence needs of people who manage them with a long-term perspective,
- Decisions about forest management are made by users themselves,
- Equal benefits are allocated to poor and disadvantaged people who participate in forest management, and
- Users have essential skills and knowledge to manage forests according to ecological and social requirements.

Developing criteria and indicators for Sustainable Forest Management is complex due to the lack of understanding of importance of criteria and indicators for monitoring progress toward sustainability, inadequate data availability, low capacity of data collection, and poor commitment to implement the criteria and indicators (FAO, 2000).

3 METHODOLOGY

3.1 Study area

3.1.1 Selection of study area

The purposed study area is purposively selected in Tilaurokot Collaborative Forest Management (TCFM) in Kapilvastu district of Nepal; which is the first collaborative forest in which so-called scientific forest management practice was started by adopting the *Irregular Shelter-wood silviculture System* for the yield regulation. This TCFM has been implementing its scientific management plan for last 5 years, which will make the study effective in case of its impacts and secondary data collection. Moreover, it can also represent other CFMs in Terai region of the country. Because of its five year implementation of management practices need to be evaluated for the replication in other blocks and forests.

3.1.2 Existing management practice in study area

As it was already mentioned in above section, TCFM is a first CFM in which so called scientific forest management practice was initiated, and now which is supported and enhanced by recently made amendments of acts and policies. First of all, TCFM is a collaborative forest management modality among the various community based forest management existing in Nepal. Because of being pioneer for the scientific forest management it make the CFMs as icon of scientific forest management; however, scientific forest management is not limited only in CFMs in Nepal by the prevailing acts and policy. It is also emphasized to implement in another CBFM model that is community forestry programs. In this connection, it is necessary to explain here, what exactly is the scientific forest management in Nepal. Although it has a very simple literal meaning, it is explained as a tool for sustainable forest management. More clearly, it a set of socially, economically and ecologically suitable management activities, which can increase and provide continuity to products and ecosystem services of the forest to achieve the sustainability of the forest. The set of management activities must be based on any specific silviculture system for the sustainable yield regulation (MFSC, 2015, MFSC, 2016a). Therefore, in TCFM, irregular shelter-wood silviculture system has been implementing through making a detail management plan. All the activities according to management plan are in practice. And the benefit sharing mechanism was found as same prescribed by the forest act amendment (2016a).

3.1.3 Location of the study area

Tilaurokot CFM in Kapilvastu district of western development region of Nepal was selected for this study. Fig. 3-1 shows the location of Tilaurokot CFM and user VDCs (the proper study area) within Kapilvastu district. The user HHs comprise of HHs in 23 VDCs and one Kapilvastu municipality. The Kapilvastu municipality and the VDCs located in the

south reaching up to the Indian boarder, 5 Km or more away from the forest, have been classified as distant VDCs and the HHs residing in distant VDCs as distant users (DFO Kapilvastu, 2015).

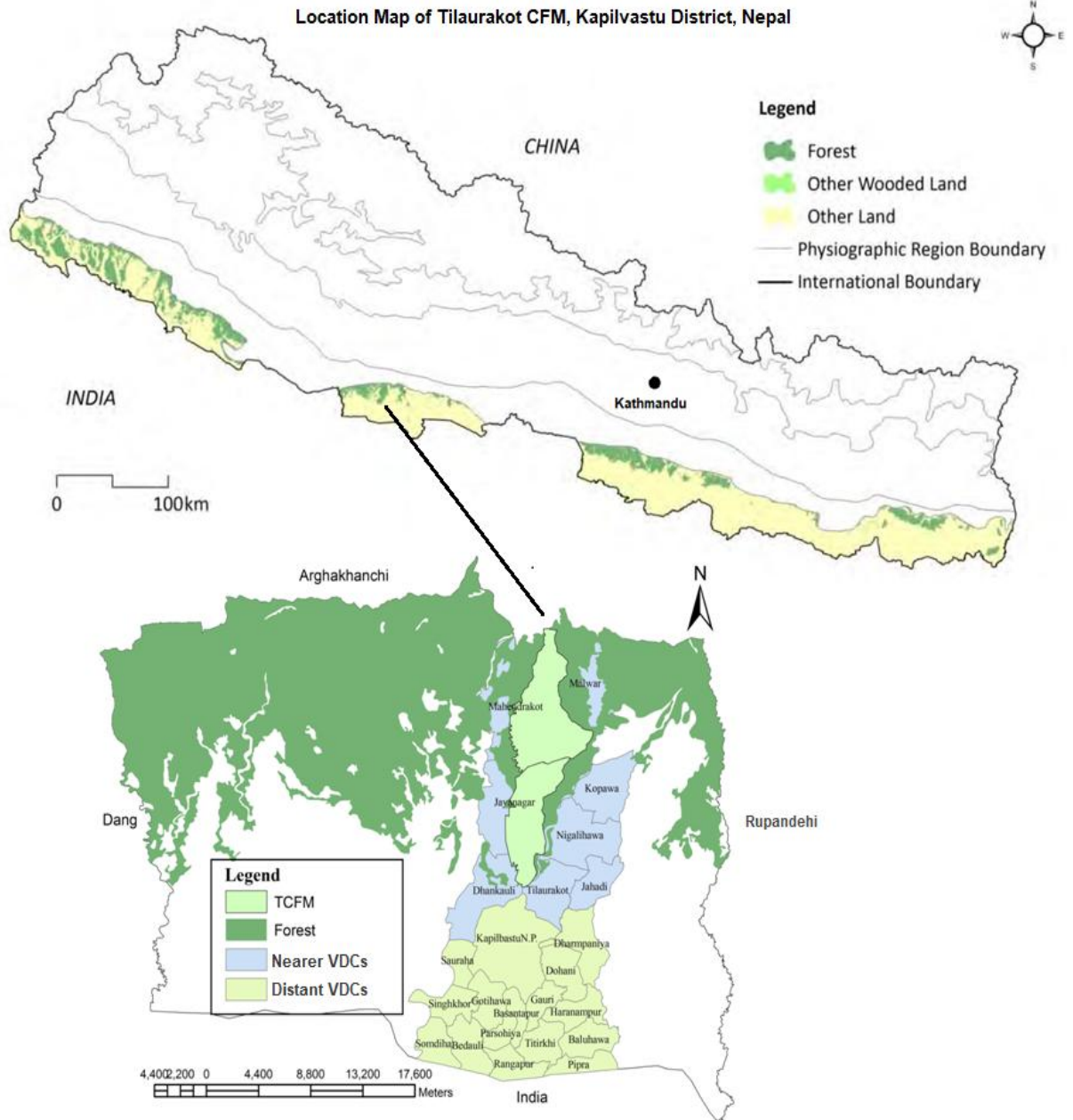


图 3-1 研究位置

Fig. 3-1 Location of Study Area (Tilaurakot CFM within Kapilvastu District)

3.1.4 General information about Kapilvastu District

A. Land-use of Kapilvastu District

Siwalik (or Churia hill) is fragile and sloppy area. This occupies about 16% of total area of Kapilvastu district. The predominant land use in Siwalik range is forestry. Unlike

Siwalik, flat low land (Terai) is predominantly used as agriculture and built-in areas, and only 34% area is occupied by forests. Forest area in Kapilvastu district accounts for more than 44% of land-use. Out of this, about 35% lies in Churia (Shiwalik) range and the rest (65%) lies in low land Terai, which may be considered appropriate for productive scientific forest management (Figure 3.2).

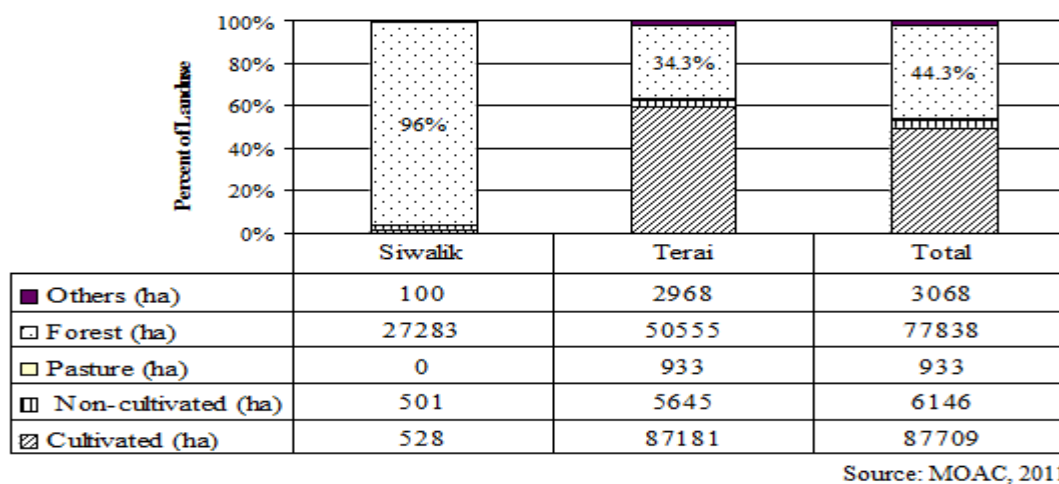


图 3-2 Kapilvastu 区土地利用
Fig. 3-2 Land use of Kapilvastu District

B. Caste and ethnic groups in Kapilvastu district

Kapilvastu is characterized by high proportion of Muslim population. The proportion of Tharu is also high (Figure 2.2)

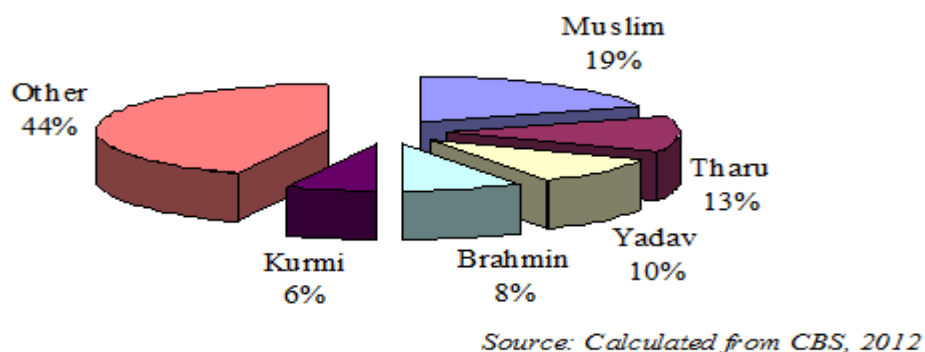


图 3-3 Kapilvastu 区主要种姓/族裔群体
Fig. 3-3 Major Caste/Ethnic Group of Kapilvastu District

3.1.5 General Information about forest of TCFM

TCFM constitutes 13.10% area of total Terai forest of Kapilvastu district. TCFM is block of forest located between 27° 35' 8.13" to 27° 45' 32.98" north latitude and 83° 1' 56.78" to 83° 9' 6.49" east longitude. The forest stretches 5.2 Km east to west and 18.2 Km

north to south (DFO Kapilvastu, 2009). Other important attributes of TCFM are presented below.

a. Growing Stock

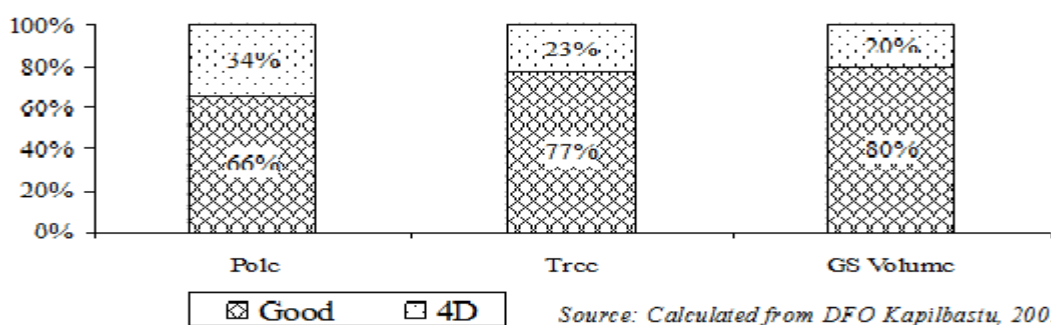
The average growing stock (GS) of TCFM is 165.25 cubic meter per hectare, which is less than the national average of 178 cubic meter per hectare (DFRS, 1999). Sal accounts for the majority of GS in TCFM (Tab. 3-1).

表 3-1 TCFM 增长存量

Tab. 3-1 Growing Stock of TCFM

Nepali	Species Scientific Name	Volume per hectare (m ³)		
		Pole	Tree	Total
Sandan	<i>Augenia ogenensis</i>	0.04	0.00	0.04
Sal	<i>Shorea robusta</i>	29.13	41.40	70.53
Teak	<i>Tectona grandis</i>	1.90	0.16	2.06
Barro	<i>Terminalia belerica</i>	2.39	0.36	2.75
Bel	<i>Aegle marmelos</i>	0	0	0
Banjhi	<i>Anogeisus latifolia</i>	11.59	3.55	15.14
Dabdabe	<i>Garuga pinnata</i>	0.14	0.00	0.14
Asna	<i>Terminalia tomentosa</i>	25.90	13.72	39.62
Mauwa	<i>Madhuca indica</i>	0.61	0.00	0.61
Jamun	<i>Sizigium cumini</i>	0.00	0.39	0.39
Sissoo	<i>Dalbergia sissoo</i>	1.08	1.04	2.12
Kusum	<i>Schlechera oleosa</i>	1.49	1.84	3.33
Karma	<i>Adina cordifolia</i>	1.24	0.32	1.56
Tendu	<i>Diospyrus spp,</i>	1.41	0.00	1.41
Khair	<i>Acacia catechu</i>	1.37	0.83	2.2
Other		13.53	9.5	23.03
	Total	92.15	73.10	165.25

Source: DFO Kapilvastu, 2009.



Source: Calculated from DFO Kapilvastu, 2009

图 3-4 TCFM 生长存量的条件

Fig. 3-4 Condition of Growing Stock in TCFM

Moreover, Fig 3.4 presents the quality of growing stock in TCFM. About 20% of the growing stock by volume is dead or dying or diseased or deformed (4D).

b. Species Composition

Species composition refers to the proportion of different species of trees in a forest. It is calculated based on number of stems, volume or basal area (BA). Fig. 3-5 presents species composition of TCFM by number of stems. A seedling is a plant of tree species measuring between 30 cm and one metre in height. Similarly, sapling is a plant greater than one meter in height and less than 10 cm in dbh. Plant measuring 10 cm to less than 30 cm at dbh is called pole. Similarly, tree is large sized plant measuring 30 cm or more in dbh (DoF, 2005). The forest is predominantly Sal (*Shorea robusta*) in all size classes (i.e. seedling, sapling, pole and tree). Sal accounts for 39-43% of total stems in all size classes except in pole. Asna (*Terminalia tomentosa*) and Banjhi (*Anogeisus latifolia*) exist as the two principal associates accounting for 19-25% and 3-14% of total stems respectively.

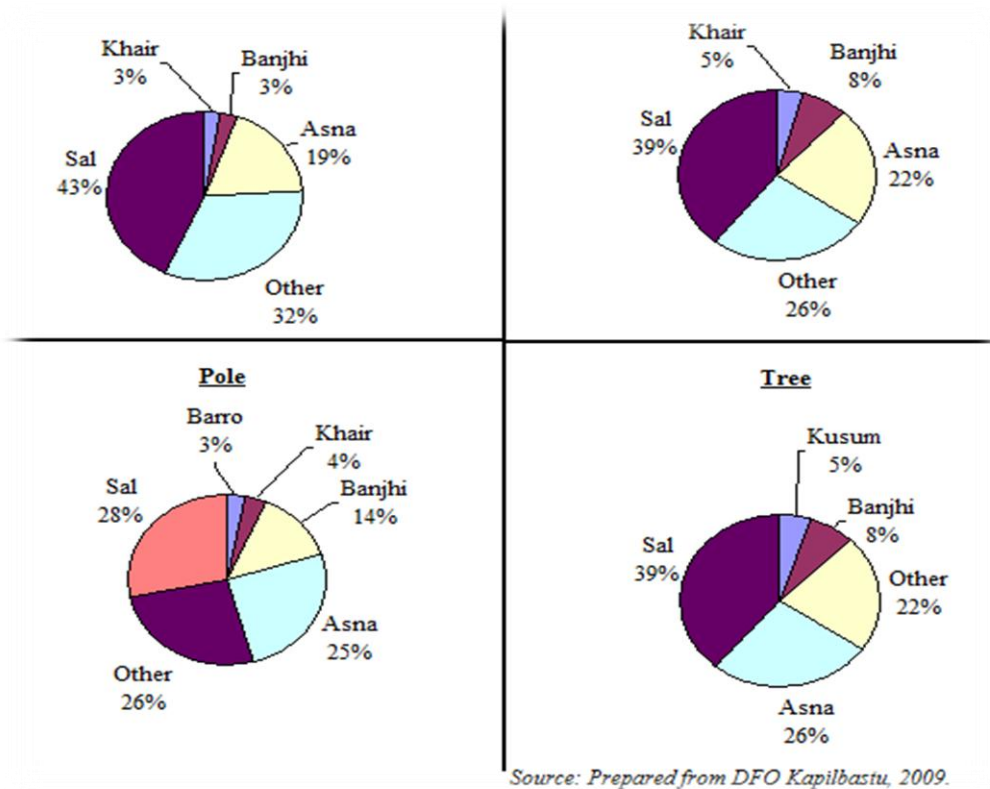


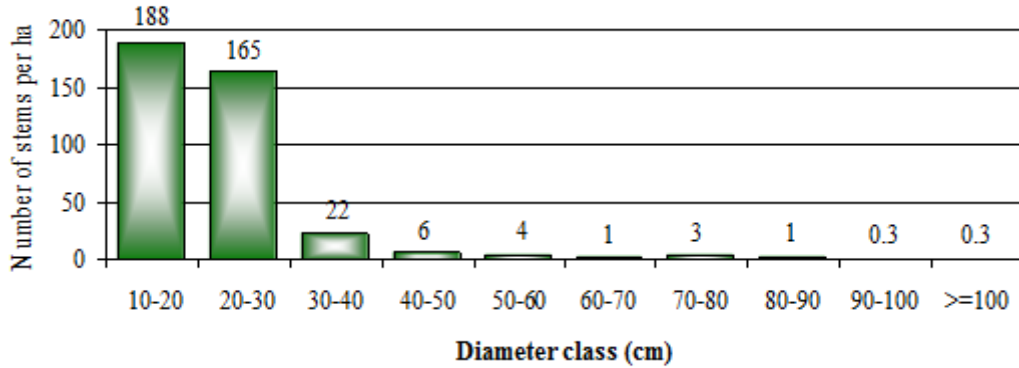
图 3-5 TCFM 茎数的物种组成

Fig. 3-5 Species Composition in TCFM by Number of Stems

c. Diameter Distribution in TCFM

Fig. 3-6 presents the distribution of number of stems (pole and tree) in different diameter classes. The total number of stems per ha is 391. As usual, the number of stems in smaller diameter classes is higher and it is lower in higher diameter classes. The number of stems in immature diameter classes (i.e. diameter classes below 40 cm at dbh) is 375, while

it is only 16 trees per ha in mature diameter classes (i.e. diameter classes 40 cm or above). The average number of trees available for harvest is 38 per ha as trees 30 cm or greater in dbh are harvestable but harvesting is concentrated in mature portion of the forest (DFO Kapilvastu, 2009), the number of harvestable tree per ha must be very high than the average figure.



Source: Calculated from DFO Kapilvastu, 2009

图 3-6 TCFM 茎直径类每公顷的数量

Fig. 3-6 Number of Stems per Hectare by Diameter Classes in TCFM

3.1.6 General Information about TCFM Group

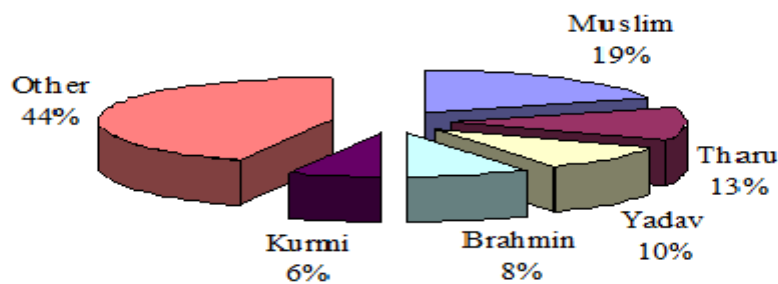
a. Population and Households

TCFMG is comprises of 22,622 HHs residing in 23 VDCs and a Kapilvastu municipality. The total population is 148,631 (DFO Kapilvastu, 2009).

b. Literacy

Literacy rate among Tilaurakot CFMG population is 43.6%. Male literacy is 56.6% and female literacy is only 29.8%. However, literacy in different VDCs varies greatly ranging from 14.2% in Sihokhor VDC to 57% in Jayanagar VDC (DFO Kapilvastu, 2009).

c. Caste/Ethnicity



Source: Calculated from CBS, 2012

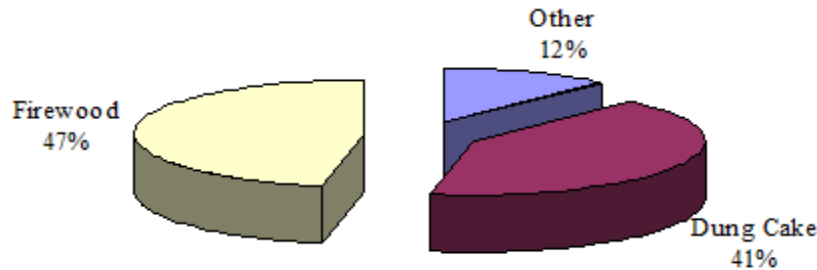
图 3-7 TCFM 的种姓/民族组成

Fig. 3-7 Caste/Ethnic Composition of TCFM Group

Like Kapilvastu district, TCFMG has a higher proportion of Muslim users followed by Dalit (11%), Brahmin/Chhetri (11%) and Tharu (10%). The proportion of other disadvantaged and non-dalit castes is slightly less than 50% (Fig. 3-7).

d. Principal Types Domestic Fuel Utilization

A large proportion of HHs (41%) in Tilaurakot CFMG still use dung cake and 47% of the HHs use firewood. only 12% of the HHs use other fuels such as cooking gas, kerosene and bio-gas (Fig. 3-8).



Source: Calculated from DFO, Kapilvastu 2009

图 3-8 TCFM 集团住户主要家用燃油类型

Fig. 3-8 Principal Domestic Fuel Types in TCFM Group Households

3.2 Data collection and analysis method

3.2.1 Data collection

Both primary and secondary data were collected to meet the objectives. Primary data were collected by semi structured questionnaire; focus group discussion, and key-informant survey. Similarly, secondary data were collected from management plan, minute registers, audit reports, old records of TCFM and other publications of district forest office, forest department and other stakeholders.

To evaluate the socio-economic and environmental contribution of collaborative forest management practices in the study area, both primary and secondary data were collected. First of all one focus group meeting was held with local forestry officials and executive committee to identify the general contributions of CFM in the study area. For example, what kinds of socio economic benefits are available there? Moreover, after listing out the benefits, revenue of both government and local community, supply of timber and firewood, job opportunities to the local peoples could be investigated from the audit reports and minutes records available in the TCFM group. This type of data of at least from last five years was collected according to its availability. To assess the economical viability of existing management plan, the necessary data to calculate the C/B ration, will also be collected from the management plan and inventory report of the TCFM group. In other hand, to evaluate the environmental contribution, the data related to regeneration status, forest fire frequency, illegal logging frequencies was collected from the TCFM group as

well as from District Forest Office. Moreover, to support this study, the secondary data from district forest office and central office of forest department was also taken. The check-list for secondary data collection from the various records of TCFM is in *Appendix: I*. During the focus group discussion, it was modified according to the nature of identified socio-economic contributions. Besides this, the subjective assessment related to the socio-economic and environmental contribution should be done by the semi structured questionnaire survey. Additionally, to compare with previous management practice, also the secondary data from previous management plan and their records was taken. Because of some limitations regarding past data of this specific forest before the implementation of CFM, some of comparison about revenue collection and production of forest products was done with reference to the whole district data from the record of Department of forest.

Furthermore, to assess the people's overall perception toward existing CFM practices in the study area the household survey was done by the semi structured questionnaire and focus group discussion. For question survey, stratified random sampling method was adopted to include all socio-economic categories of people. For that primary discussion was done with forestry staffs and executive committee members.

To assess the sustainability, this study has used criteria, indicators, and verifiers developed by Pokharel et al. (2013), for sustainable community based forest management practices in Nepal. These criteria and indicators were assumed as very compatible in the context of Nepal's community based forest management. They have identified locally 4 criteria, 26 indicators, and 60 verifiers. The four criteria include i) extent of forest resources, ii) economic and social benefits, iii) forest management practices, and iv) institutional framework and governance. The number of indicators for different criteria ranges from 5 to 8. Similarly, the number of verifiers for different indicators varies from 11 to 18 (*Appendix II*). Local people perceive forest management as one of the main activities in community based forestry and considered it as criteria for sustainable community based forest management (Pokharel et al., 2013; Pokharel et al 2014).

Sample Size for questionnaire survey

To narrow down the vague study area, preliminary discussion was done before making this proposal with forestry officials of District Forest Office, Kapilvastu, to make the questionnaire survey more effective and more informative; the Tilaurakot Collaborative Forest Management (TCFM) Group was considered as sample population (N=314). This group represents every ward number of every Village Development Committee (VDC, smallest administrative unit in Nepal) of beneficiaries. Therefore, to draw the sample from the total members of TCFM group, stratified random sampling was adopted. The sample size was determined by applying Cochran's sample size calculation formula (Cochran, 1977).

Where,

Cochran's sample size formula for categorical data for an alpha level a priori at .05 (error of 5%) = $n^0 = (t)^2 * (p)(q) / (d)^2$

Where: n^0 = an alpha level a priori at .05 (error of 5%)

t = the value for the selected alpha level, e.g. 1.96 for (0.25 in each tail) a 95 percent Confidence level.

p = the estimated proportion of an attribute that is present in the population. q is 1-p.

(p)(q) are the estimate of variance. (Here, p = .95 and q = 0.05)

d = the acceptable margin of error for proportion being estimated, so the confidence interval, in decimals (+/- 4 i.e. 0.04)

N (total population) = 314 Member (Total member of TCFM group)

Now, Sample size (n) = ?

Then, $n^0 = (t)^2 * (p)(q) / (d)^2$

$$= (1.96)^2 * 0.95 * 0.05 / (.04)^2 = 114.05$$

By Cochran's formula $n = n^0 / [1 + \{(n^0 - 1) \} \div N]$

$$= 114.05 / (1 + 113.05 / 314)$$

$$= 83.8 \text{ (i.e., 84 sample from total group members)}$$

Hence, the number of sample was not less than 84; this is 26.7% of total group members.

3.2.2 Data analysis

The Comprehensive contribution of TCFM was mainly categorized in three parts; social contribution, economic contribution and environmental contribution. Available socio-economic and environmental data were qualitative and quantitative, those were analyzed by using statistical toll, SPSS to calculate frequency percentage, mean, and summarized accordingly. The qualitative data were analyzed by descriptive measures and be presented in form of charts, figures and tables.

A. Cost benefit analysis of TCFM plan

To assess the economical viability of this management practice Benefit Cost ratio (B/C ratio) was calculated. For that; benefit and cost for 10 years period was taken from the management plan of TCFM. Then, Benefit cost ratio (BCR) will calculate as follows:

$$\text{Present value of benefit} = \text{Future value of benefit} / (1+i)^n$$

$$\text{Present value of cost} = \text{Future value of cost} / (1+i)^n$$

Where,

Interest rate (i) = 10% (For this study interest rate (i) is taken as 10%)

n= future year related with future value

Then, B/C ratio = Present value of benefit / Present value of cost

Average B/C ratio = Sum of present value of benefit /Sum of present value of cost

(Source: Pradhan, 2010)

B. Analysis of the people’s perception by using Likert scale

The perception of users regarding management practice in TCFM was analyzed by using Likert-scale method. A Likert item is simply a statement in which the respondent is asked to evaluate according to any kind of subjective or objective criteria; generally the level of agreement or disagreement is measured. Often five ordered response levels are used. The responses of the respondent were measured in 5 different levels namely “1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree” in a Likert format. Number weight will assign to each response option 1 to 5 in an order of 'strongly disagree' to 'strongly agree'. From the number weight and frequency of each option, Likert-score was calculated interpretation was done as follow:

$$\text{Likert Score\%} = [\text{Total number weight} / (5 * \text{Number of respondents})] * 100$$

表 3-2 李克特分数释义

Tab. 3-2 Interpretation of Likert score

Likert Score Range	Scale	Description or Conclusion
85-100%	Strong or Very good	Highly satisfactory and need to continue as it is
65-84%	Strong or good	Satisfactory but there is still room for improvement
50-64%	Medium	Not dissatisfactory but there remains many things to improve
35-49%	Weak or disagree	Unsatisfactory and needs excessive improvement
<35%	Very weak or strongly disagree	Very unsatisfactory and significant change is urgent for improvement

Source: Subedi, 2013

C. Statistical test to compare between two distance category

After the analyzing the peoples’ perception on the management practice of TCFM, Mann-Whitney U test was used to compare two groups (<5km and >5km) by ranked scores for different variables. Usually, this test is used for the ordinal that doesn’t meet the necessities for parametric test. This test is mainly used to infer whether there are differences in the "distributions". Since it is non-parametric test, it does not assume any assumptions; however, it needed sample randomly drawn and assumed independence within the samples and mutual independence is assumed (Graham, 2016).

Calculation of the Mann-Whitney U

$$U = n_1 n_2 + \frac{n_2 (n_2 + 1)}{2} - \sum_{i=r_1+1}^{n_2} R_i$$

Where,

U=Mann-Whitney U test; N_1 = sample size one; N_2 = Sample size two; R_i = Rank of the sample size

Furthermore, among many benefits not all the benefits are taken from all respondents, from two different distance category may have get chance of taking different benefits. To test if there is any significance difference between taking different benefits from forest with two groups nearer (<5km) or Distant (>5km) Pearson chi square test was done. By this statistical test it can be known, whether there is significant relationship between two categorical groups. And for further bivariate analysis we had used the binary logistic regression model.

D. Assessment of sustainability

Furthermore, for measuring the sustainability index of this TCFM, different layers of data from different sources was processed, manipulated and analyzed through an integrated approach. Qualitative data was analyzed in descriptive manner and quantitative data was analyzed using different statistical tools as required. Acquired information from different PRA methods was categorized and coded in order to summarize and simplify them in to some meaningful and manageable themes in the context of predefined Criteria & Indicator (C&I). To be able to assess and compare level of sustainability of the study site, information belonging to each indicator will further assigned ordinal value based on suitable scale. All data regarding sustainability of the CFM will scaled according to the Likert's three points scale (1 = Poor, 2 = Medium or fair, 3= Good) so that the data collected by different means and methods of each criteria and indicators was scored as 1 to 3 in an increasing order. Later, these scores will converted to sustainability index taking the highest value as 3. It means that the responses towards sustainability of the CFM were scored with higher value and opposite with lower value. All the indicators will score following the options in the scale generated from C&I developed by Pokharel et al, 2013 given in *Appendix II*. Scores were assigned by guidance of the verifiers for each indicator. And then scores of the verifiers for each criterion were calculated by summing up the scores of each indicator's verifiers. Further, weightage for each indicator was assigned. Finally, the Sustainability Index of Individual Criteria (SIIC) and "Overall Sustainability Index" (OSI) was calculated by using following formulae as recommended by Singh, (2000).

$$SIIC = \frac{\text{Sum of weighted scores of verifiers}}{\text{Number of verifiers of indicators in the respective criteria}}$$

$$OSI = \frac{\text{Sum of SIIC}}{\text{Number of criteria}}$$

Where, SIIC: Sustainability Index of Individual Criteria; OSI: Overall Sustainability Index (Source: Singh, 2000)

As it was mentioned in previous section the criteria and indicators used to study the sustainability of community based forests in Nepal by Pokharel et al 2014, were very compatible and realistic to the context of Nepal. Therefore, same assessment model was used in this study. Accordingly, same weightage were provided to the each indicator. The provided weight was, 15% for C1: Extent of forest resources; 25% for C2: Economic and social benefit; 20% for C3: Forest management practices; and, 40% for C4: Institutional framework and governance. And, finally the interpretation of OSI was also done as same basis. That means, if OSI is greater or equal to 0.50 then it can be assumed that existing practice of management is towards achieving the sustainability goal. Higher the OSI value higher the sustainability.

3.3 Framework of the study

The research was begun with bringing thoughts on the problem areas, consulting some forestry officials of Nepal regarding CFM practice. On the basis of preliminary survey and discussion with forestry officials of Nepal on this topic, the thesis proposal was prepared. Series of discussion with supervisors encouraged critical thinking on the concepts. In summary the following steps were followed during whole study period.



图 3-9 研究框架

Fig. 3-9 Framework of the study

4 RESULT AND DISCUSSION

4.1 Comprehensive contribution of CFM practice in the study area

On the basis of key informant interview, and compilation of secondary data available in TCFM group, District Forest Office, Kapilvastu and Department of Forest, Kathmandu; the evaluation of comprehensive contribution was done. It includes mainly social, economic and environmental performance of the forest as contributions. Socio-economic contribution may be very vague by the literal meaning, however, in this study, it has mainly covered the contribution in revenue collection of both government and the TCFM group, forest based job creation, supply of forest products and other social support and development. By the compilation and analysis of available data has shown following results.

4.1.1 Social Contributions

The main contribution of CFM practice in social aspect was described as below. In this study, the evaluation of social contribution was done by performance status of TCFM to supply the forest products to the users group that was not easy and regular before this practice started.

a. Households benefited by forest product type

TCFM benefited about 1000 household by providing fuel-wood necessary for cooking and heating. The large dependency on forests for fuel wood is not surprising as fuel wood still remain the primary energy source for rural households in the southern plains of Nepal (CBS, 2015). Moreover, the baseline data of the study area showed that about 47% of people were using firewood as a source of cooking fuel while 41% were using dung cake (DFO, 2009). The CFM has contributed by benefiting 141 households with timber and 104 households by providing pole in subsidized price on average yearly basis.

表 4-1 通过森林产品受益的住户数目

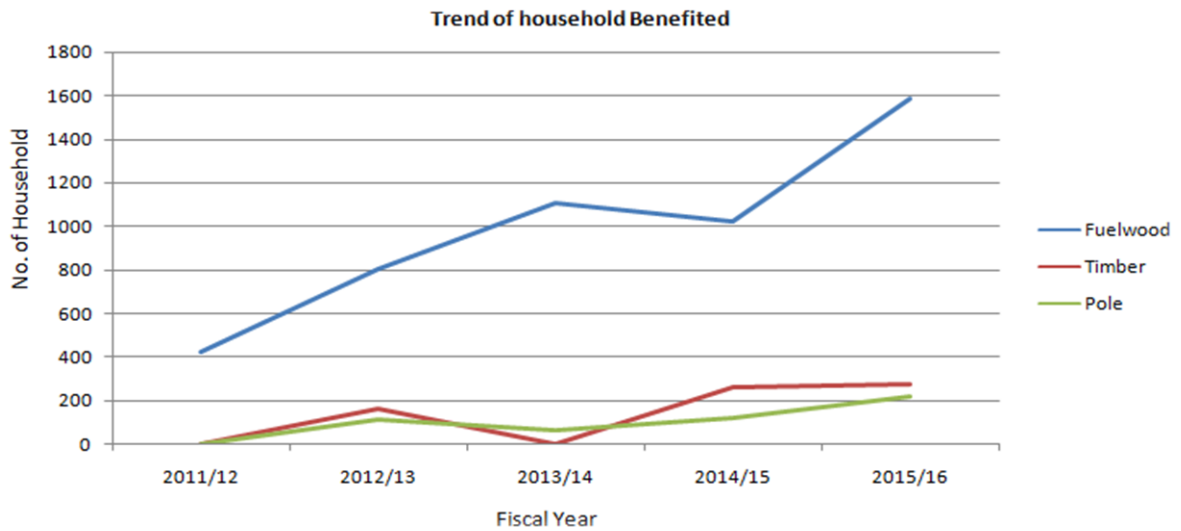
Tab. 4-1 Number of household benefited by forest product type

Fiscal year	No. Household benefited by forest product type		
	Fuel-wood	Timber	Pole
2011/12	420	0	0
2012/13	805	163	115
2013/14	1110	0	65
2014/15	1020	264	121
2015/16	1589	278	219
Average per year	988.8	141	104

Source: DFO, Kapilvastu, 2016 & TCFM Group, 2016 (Compiled by author 2017)

Moreover, the graph (Fig. 4-1) depicts the trend of the number of households benefiting from fuel wood, timber and pole during the recent five year period. The number of households benefiting from fuel wood has visibly increased during the last five years,

which can be partially attributed to the increasing number of households depending on fuel wood as primary energy source due to the soaring fossil fuel prices. In particular, the spike on the year 2015/16 is probably because of the trade embargo India placed on Nepal that severely limited the volume of fossil fuel entering Nepal via India, and pushed large number of households towards fuel wood usage as primary household energy source. The number of households benefiting from timber and pole is also in rise during the past 5 years, but the rise is not as remarkable for the fuel wood. And since timber and pole are primarily used for construction purposes, and the fact that the users have to pay for them, the demand for timber/pole has not soared despite increased production.



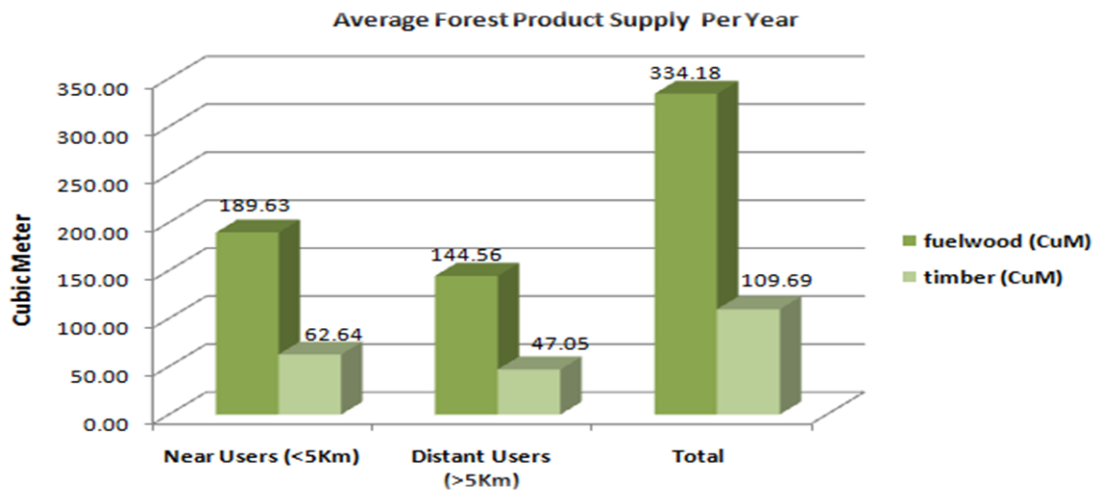
Source: DFO, Kapilvastu, 2016 & TCFM Group, 2016

图 4-1 不同年度森林产品受益户数的趋势

Fig. 4-1 Trend in number of households benefited by forest products in different fiscal years

b. Forest product distribution by distance category

The results are compiled and analyzed by the author from secondary data available from District Forest Office (DFO), Kapilvastu and Tilaurakot Collaborative Forest Management Committee. The overall forest product distribution in subsidized price is categorized into two groups one is within 5 kilometer from the forest and another is outside 5 kilometer from the forest. The average per year fuel wood distribution by the TCFM, inside the user group, was found about 334 m³ and the timber wood was found about 110 m³; which is further distributed amongst the two category user group (Fig. 4-2).



Source: TCFM Group, 2016

图 4-2 按距离分类的平均每年森林产品分布情况

Fig. 4-2 the distribution of average annual forest products by distance

The chart shows that the amount of forest product supply is larger for nearer users than for the distant users. Based on this finding, it can be inferred that even though the population of people living at a distance more than 5km from the CFM boundary is larger than that within the 5km distance, the distant users (>5km) were disproportionately receiving fewer timber and fuel wood from the CF compared to the nearby users (<5km). This raises the classic ‘equity’ problem. However, in the case of TCF, the equity issue was resolved using appropriate policy instruments such as price subsidies for distant users among others. Equitable distribution of products and benefits was among the primary objective of the establishment of TCFM group as reflected in their constitution, and the efforts made for an equitable distribution of forest products has been remarkable contribution to the establishment objectives. Forest products and distance has been a classic and interesting case for research studies in Nepal and elsewhere and nowhere in these studies have the users came up with an innovative solution such as subsidy, for which TCFM users deserves ‘applaud for the effort’. However, grievance of the distant users still remain which shall be discussed in detail in the coming sections.

c. Creation of local employment

Apart from the revenue generation, the TCFM is equally contributing the local employment and economy. Since its establishment 6 years ago, the CFM has contributed 101,063 man days of employment that would equal to \$ 2282,179 of wage equivalent (Tab. 4-2). The years following the establishment (2011/12) saw the highest number of man days of employment created, and the years following have seen an initial drop and later rise in both man days of employment and the revenue generated. The employment aspect of the CFM has multitude of direct and indirect impacts, on local economy, livelihood capital formation as well as on conservation. The direct impact on local economy comes from the

wage, reflected in a higher monthly or annual income of the beneficiaries. Local employment generation equally favors the formation and accumulation of human and social capital, as evident by the network and skills developed by the locals while employed in CFM activities. The impact on conservation is also self-evident by the reduced number of local infiltrations inside CFM for timber and other forest products. Therefore, in case of TCFM, local employment generation cannot be narrowly viewed as source of employee's family income because of its manifold direct and indirect impacts on livelihood capital and conservation.

表 4-2 过去五年 TCFM 提供的本地就业机会

Tab. 4-2 Local employment provided by TCFM in last five years

Fiscal Year	Man Days	Worth (US\$)
2011/12	34133	90021.82
2012/13	16559	43672.44
2013/14	12257	32326.41
2014/15	18753	53955.12
2015/16	19361	62203.27
Total	101063	282179.05
Average Per Year	20213	56435.81

Source: DFO, Kapilvastu, 2016 & TCFM Group, 2016

4.1.2 Economic Contributions

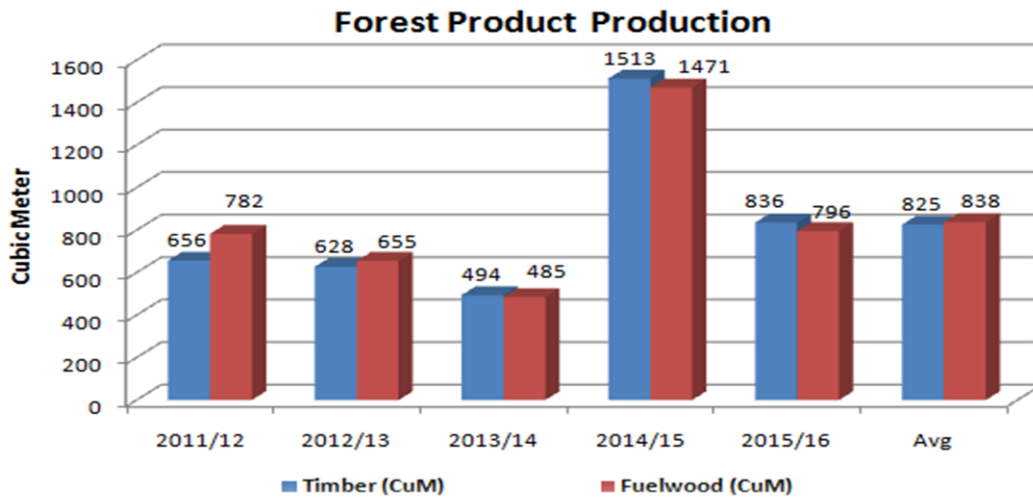
To evaluate the economic contributions, the situation of forest products and revenue flow in both TCFM User's group and the Government by the implementation of CFM practices in TCFM group was analyzed and presented as following.

A. Production of timber and fuel wood

The bar diagram (Fig. 4-3) shows the annual production of timber and fuel-wood by the TCFM group from their forest during the last five fiscal years, which also happen to be the first five years after the formation of TCFM group. It can be safely assumed that the overall growing trend of volumetric production of both timber and firewood is attributed to proper silviculture and forest management operations by the users group. The graph shows, in the first fiscal year the timber and fuel-wood was produced 656 m³ and 782 m³ respectively. It was found slightly decreased in next two fiscal years, however, in 2014/15 it reached highest at which year the timber and fuel wood was produced 1513 m³ and 1471 m³ respectively. The average per annum production of timber and fuel wood for the last five fiscal years were 825 m³ and 838 m³ respectively.

Furthermore, to confirm the contribution of CFM practice in forest product production, it was tried to make a comparison between before and after data. However, any specific past data for this particular forest (TCFM area) about the timber and fuel wood production

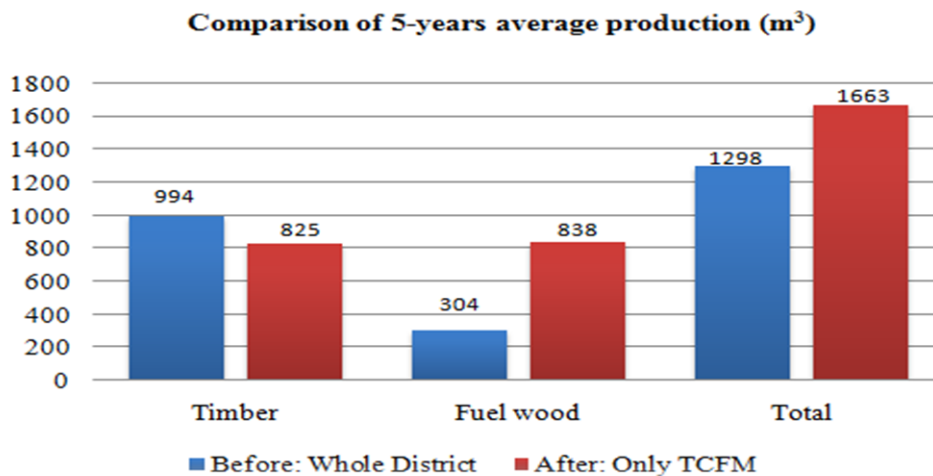
and sale was not found. Therefore, to evaluate the contribution of TCFM in timber and fuel wood production it was compared with the average production of whole district before the implementation of CFM practice. Even though, the total average production of this particular forest was found in larger quantity than the total production of whole district before the implementation of TCFM (Fig. 4.4). By this finding it can be said that CFM practice has highly significant contribution in producing forest products for the society.



Source: TCFM, 2016

图 4-3 过去五年木材和燃料木材生产

Fig. 4-3 Timber and Fuel-wood Production in last five years



Source: DOF, 2016 and TCFM, 2016

图 4-4 TCFM 实施前后生产比较

Fig. 4-4: Comparison between production before and after TCFM implementation

While fuel wood might be the product with the most demand, timber dominates as the primary source of revenue for both CFUG and the government (Tab. 4-3). An equitable distribution of revenue between the local users and between the users and the government

COMPREHENSIVE CONTRIBUTIONS AND SUSTAINABILITY OF COLLABORATIVE FOREST MANAGEMENT PACTICE: A CASE FROM TILRAKOT CFM, NEPAL

has remained at the core of collaborative forest provision and policies. In fact, the equity can also be visualized when the revenue book of the users group and the government for any year are compared side by side. As such, the revenue from the forest was quite similar for both the CFMUG under study and the government for the year 2015 (USD 556506 and 579991 respectively). These figures agree on with the very essence of the formation of TCBFM in first place. The trends are discussed in the subsequent headings.

表 4-3 TCFM 集团与政府近五年的税收情况

Tab. 4-3 Revenue collection of TCFM group and Government of last five years

Description	CFM Group		DFO/Government	
	Product Distribution	Revenue/ Income (US\$)	Auction & Distribution of Product	Revenue (US\$)
Timber (m ³)	858.66	219456	1791.55	
Fuel wood (m ³)	1670.92	35878.24	2005.36	
Pole (No.)	5490	9274.12	0	
Timber Stock (m ³)	1034.20	279938.24	102.44	
Fuel wood Stock (m ³)	324.23	8410.76	0	
Pole Sock (No.)	3700	3548.48	0	
Total		556506.13		579991.41
Average income per year		111301.23		115998.28

Source: DFO, Kapilvastu, 2016 & TCFM Group, 2016

B. Forest product & Revenue collection trend of District Forest Office (DFO)

表 4-4 整体木材生产和收入征收水平 DFO, Kapilvastu

Tab. 4-4 Overall timber production and revenue collection as a whole of DFO, Kapilvastu

Fiscal Year	Timber (m ³)	Fuel wood (m ³)	Total Volume (m ³)	Revenue \$	Average of 5 Years before and after			
					Timber (m ³)	Fuel wood (m ³)	Total Volume (m ³)	Revenue US\$
2006/07	1193.43	0.0	1193.4	103074				
2007/08	2303.94	778.1	3082.0	170226				
2008/09	1204.03	654.8	1858.8	59142	994	307	1301	73178
2009/10	0.00	0.0	0.0	0				
2010/11	270.33	102.0	372.4	33449				
2011/12	0.00	0.0	0.0	0				
2012/13	986.59	832.1	1818.7	285263				
2013/14	528.55	3.8	532.4	126423	734	882	1616	249078
2014/15	482.75	805.8	1288.5	137291				
2015/16	1672.66	2768.5	4441.1	696415				

Source: Department of Forest, Kathmandu (2016), Compiled by author, 2017

The main objective of table (Tab. 4-4) to display here is, to explore the timber production and revenue collection of DFO, Kapilvastu in last decade. Here, whole decade is divided in to two parts that is 5 years before the formation of TCFM in the district and 5 years after the formation TCFM and implementation of its activities. There is also calculated the average Timber, Fuel wood and Revenue collection of each five years.

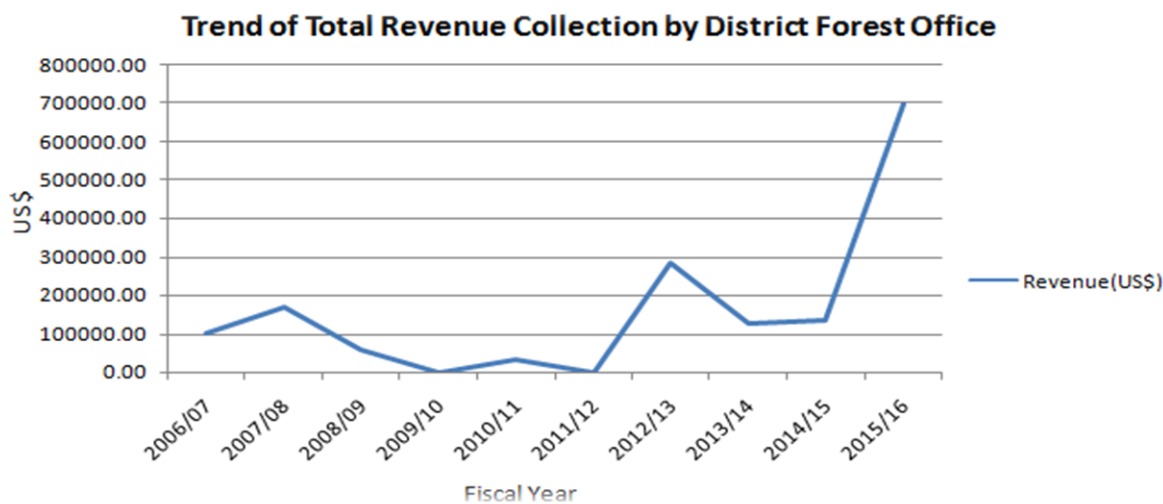


图 4-5 十年 DFO 税收征管趋势

Fig. 4-5 Trend of revenue collection by DFO over a decade

The above table (Tab. 4-4) and figure (Fig. 4-5) show the average timber production of DFO in recent years was found bit lower than previous years, however the quantity of fuel wood is significantly increased. In total volume together with timber and fuel wood and total revenue is also greater in recent years. Therefore, after the implementation of CFM practice it also has influenced the whole DFO (Government) revenue. In other hand, this practice has provided big shares of forest product production and revenue for TCFM group, which was not provided by the previously existing management system. Therefore, we can say, this practice has totally contributed in the forest product income and revenue collection of local users group named TCFM Group without decreasing the revenue of government.

C. Benefit Cost analysis of TCFM Plan

Benefit-Cost Analysis (BCA) provides a very good overview of the strengths and weaknesses of a project and its alternatives from a purely financial ground. As its name suggests, BCA involves adding up the present and the expected future benefits in present value of a course of action, and then comparing these with the costs associated with it in the present value. Present value of benefits and costs together with the net present value (NPV) and the benefit cost ratio serves a good estimate of the financial strength of the project, now and in the future. While theoretically the national as well as the local regulations require a detailed BCA before an ecologically/economically significant area

like TCFM could be handed over to local communities (or private firms), it is rarely practiced. Therefore, it was attempted to calculate BCA by using the secondary data from the inventory report and management plan of TCFM.

The result (Tab. 4-5) showed a culmination and a steady stream of benefits from year 4 onwards. Likewise, the costs culminated and steadied year 4 onwards also. For a 10 year scenario, the present value of benefits (PVB) was NRs 938 million whereas the present value of costs (PVC) was NRs 172 million. The B/C ratio showed an astounding 5.4, which is higher compared to other natural resources related projects such as community forestry. However, the calculation of growing stock (GS) and annual allowable harvest (AAH) of forest was calculated by sampling method in management plan that is likely to be overestimate. That may be the reason for astounding figure (5.4) of BCR. On the other hand, because of being a natural forest, from a purely benefit and costs point of view, the TCF proved to be highly beneficial at an interest rate of 13%, which is an average bank base interest rate in Nepal. Therefore, from a financial ground the project (TCF) is worth undertaking. The details of B/C analysis is attached in *Appendix: V*.

表 4-5 利用 NPV 和 B\C 比率对 TCFM 计划进行成本效益分析
Tab. 4-5 Cost Benefit Analysis of TCFM plan by using NPV and B\C Ratio

Year	Benefit	PV-B	Cost	PV-C	NPV	B/C ratio
1	41327.6	36573.1	14865.5	13155.3	23417.8	
2	82655.2	64731.1	25827.5	20226.7	44504.4	
3	123982.8	85926.3	32233.5	22339.4	63586.9	
4	245110.4	150330.8	38579.5	23661.5	126669.3	
5	245110.4	133036.1	38379.5	20830.9	112205.3	
6	245110.4	117731.1	37959.5	18232.7	99498.4	5.4
7	245110.4	104186.8	37959.5	16135.1	88051.7	
8	245110.4	92200.7	37959.5	14278.8	77921.9	
9	245110.4	81593.5	37959.5	12636.1	68957.4	
10	245110.4	72206.7	37959.5	11182.4	61024.2	
Total in NRs (,000)	1963738.4	938516.2	339683	172678.9	765837.3	
Total in US\$ (,000)	18833.2061	9000.827	3257.725	1656.075	7344.752	

Note: Interest rate is assumed as 13%; Basically, the amount is calculated in NRs thousands. And, It was converted @ 1US\$=NRs104.27 (Nepal Rastra Bank, 2017.04.04)

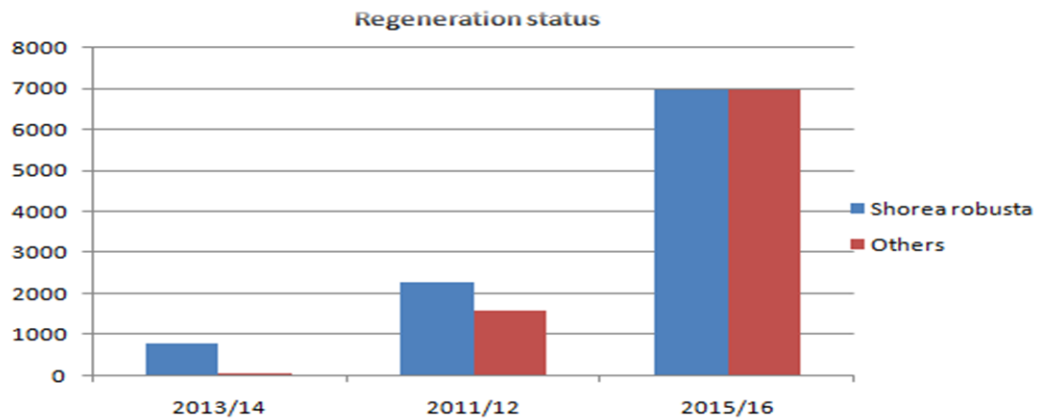
PV-B = Present value of benefits, PV-C = Present value of Costs, NPV = Net Present Value; Present value (PV) = Future value/(1+i)ⁿ

4.1.3 Environmental contributions

A. Improving regeneration Status

To evaluate the environmental contribution of CFM practice in the study area, secondary data from DFO and TCFM were collected and analyzed. For the verification

field visit was done and some photo archive maintained at DFO made more apparent the contribution of CFM practice in improving the regeneration status of the forest.



Source: DFO, Kapilvastu, 2016

图 4-6 森林实验室的再生状态与管理活动

Fig. 4-6 Regeneration status of forest compartment with management activities



Source: DFO, Kapilvastu 2016

图 4-7 五年来 TCFM 再生状况的变化

Fig. 4-7 Changing status of regeneration in TCFM over five years

It was found that the regeneration status of key forest species (*Shorea robusta*) had improved over the past 3 years, and so was for other forest species (Fig. 4-6). The increasing regeneration, which is often seen as a proxy of the forest health and biodiversity, was primarily achieved through improved and increased forest management activities, improved monitoring and patrolling of the forests, and an improved fire control. This is a

huge achievement, given that it has only been 5 years or so of the establishment of TCF. The regeneration status was also field verified by the author with relevant pictures to substantiate the claim of increased regeneration by DFO (Fig. 4-7).

B. Decrease in the forest fire occurrence

In the last five years of implementing TCFM plan, the occurrence of forest fire has reduced extensively. This was achieved by establishing new fire lines and barbed wire fencing in sensitive areas to promote regeneration. Although the official record on fire frequency was missing, the key informant interview and field observation information was quite sufficient to establish the assertion that forest fire occurrence had reduced after the formation of TCF. Several activities were being carried out by the users, such as sweeping the leaf litter, cleaning the fire breaks etc. in order to minimize the risk of fire. As the saying goes “fire is a good servant, but a bad master”, controlled fire activities were still in use whenever necessary for optimum regeneration and biodiversity.

表 4-6 防火线与隔离带施工现状

Tab. 4-6 Status of Fire-line and Fencing construction

SN	Description	Unit	Quantity
1	Finished fire-lines (uprooted, leveled and 5m wide, motor able)	Km	110
2	Barbed wire fencing in sensitive area to promote regeneration	Km	33.5

Source: DFO, Kapilvastu, 2016



Source: DFO, Kapilvastu, 2016

图 4-8 TCFM 的控制火情和防火线

Fig. 4-8 Control burning and fire-line inside Tilaurakot Collaborative forest.

C. Decrease in illegal felling

After the implementation of CFM plan in the forest TCFM group has been capable of hiring forest waters for the regular patrolling of the forest by its own budget. Altogether 15 regular forest watchers are employed in monthly basis all over the year. In other hand, CFM programs are priority program in Nepal according to the forestry strategic plan, 2016

(MFSC, 2016). Therefore government has also allocated regular budget for the development and management of the CFM. By this reason, regular patrolling of DFO staffs was found in the forest which ultimately controls the illegal felling. Nonetheless, many tending operation activities, management activities and timber collection activities, guided by the TCFM plan, have increased the regular flow of people inside the forest along the year that also discourage illegal felling. These all above mentioned activities and efforts are the result of implementation of CFM practice in that forest and it can be said that it has contributed to decrease the illegal felling in the forest.

D. Decrease in poaching

The forests in southern plains of Nepal are rich biodiversity as they serve as the last habitat for many endangered wildlife species such as one horned Rhino and Bengal tiger. Given the significance of these forests, any management practices in field should provide appropriate incentives for the local people to conserve the inherent biodiversity. One apparent objective of the collaborative forest management is to protect the wildlife and their habitat in those forests (MFSC, 2016). The household survey and the key informant interview as well as the review of the secondary data indicated that the wildlife population in the collaborative forests is increasing. The flip side of an increasing wildlife population and the habitat is the increased incidences of human wildlife conflicts. The locals were very vocal about the increasing incidences of wildlife damage to their crops and property and an increased rate of fatality. While barbed wire fences are installed in many areas around the CFM area, they are not sufficient.

Critics of collaborative forest management suspect that the human activities inside the pristine forests would only destroy the natural habitat of wildlife, and trading biodiversity with economic gain of the local residents should not be acceptable in any form. However, in case of TCFM, the wildlife population and habitat generally seemed to have positive impacts of the management approach. Given that the forest management and harvest activities are limited to compartments and sub compartments for a certain year, and the rest is left relatively untouched, there is very little chance that the entire wildlife habitat inside the TCFM area to be disturbed or destroyed. Conversely, increased monitoring and patrolling by human around the forests has in fact helped reduce the illegal activities including poaching.

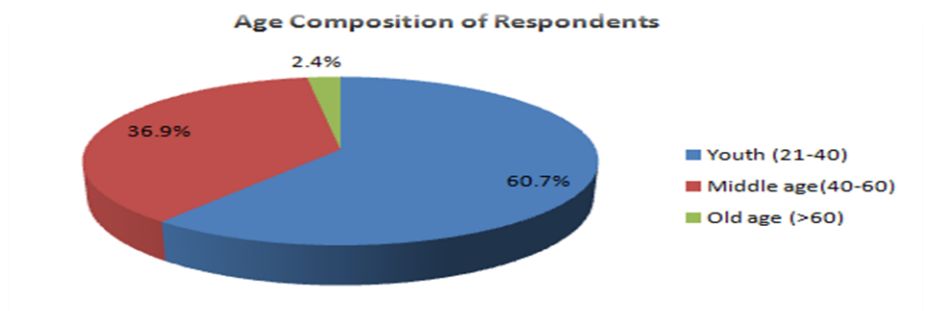
4.2 Overall perception of people toward existing CFM practice

4.2.1 Characteristics of Respondents

Respondent characteristics based on age group, occupation, education level, their family size and demand for forest product is described in the following subheadings. The average family size was found of 6 members in a family with the minimum value of 3 members and the maximum value of 23 found in the study area. Moreover, only the 10 % of respondents had the experience of being executive committee member.

a) Respondents by age category

The age structure of the respondents (Fig. 4-9) showed that more than 60% respondents belong to youth (21-40 years) category; above 36% respondents were middle age (40-60) category, and; only 2.4% were of old age (above 60 years). The well representation of all age categories reveal that questionnaire survey was more informative and reliable because it has included the thoughts of all age class. Moreover, the age category for the youth can be assumed as more informative and aware group in the society who can keep well concern in socio-politics activities of the society and are better options for evaluating the social changes (Ho et al., 2015). This fact has also increased the validity of this study.



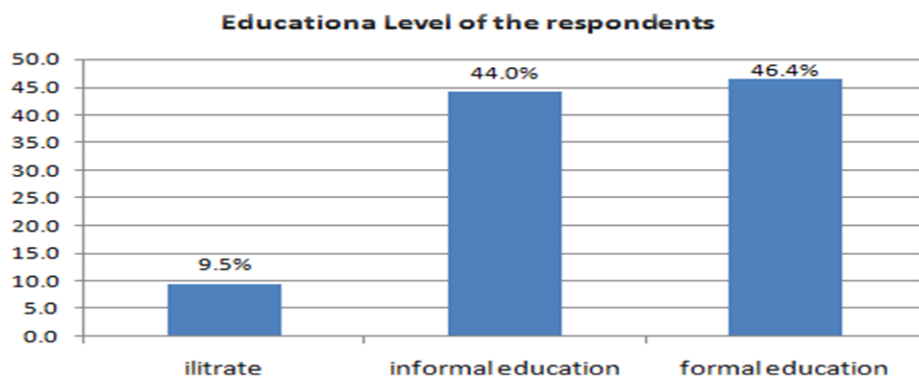
Source: Questionnaire Survey, 2016

图 4-9 按年龄分类的答卷人

Fig. 4-9 Respondents by age category

b) Respondents by education

The respondents were categorized in three different levels by education. 9.5% of respondents were illiterate who never had taken any kind of education. And, 44.0% of respondents were informally educated, that means not going school or learned by the adult education system. Behind, more than 46% of respondents were formally educated and at least had passed school level. The education level of respondents is shown in Fig. 4-10.



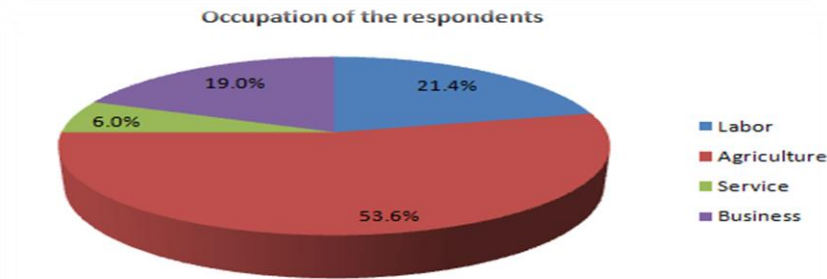
Source: Questionnaire Survey, 2016

图 4-10 受访者的教育水平

Fig. 4-10 Education level of the respondents

c) Respondents by occupation

The main occupation of the respondents was found as agriculture. Mostly all of the respondents were involved in agriculture. Besides, about 54% of the respondents were solely depended in agriculture; whereas only 6% were service holder. Similarly, 19% were in business and more than 21% respondents were labor and mainly based on forest activities. The composition of respondents in different occupation is shown in Fig. 4-11.



Source: Questionnaire Survey, 2016

图 4-11 受访者的职业

Fig. 4-11 Occupation of the respondents

d) Know about Operational Plan

It was found that only 15 respondents were aware about the operational plan and its content. (Tab. 4-7). It was surprising that majority (60%) of the respondents practicing agriculture as the primary family income source was unaware about the operational plan and its contents. On the other hand, respondents involved in business had a higher level of knowledge about the operational plan, compared to respondents from other occupational categories. This can be attributed to the relatively lower level of education and the socio-economic status of farmers compared to other occupational categories that they are not actively participating in the decision making and implementing, including the preparation of operational plan.

表 4-7 按职业类别了解管理计划

Tab. 4-7 Know about operational plan by occupational categories

Occupation	Know about OP			
	No		Yes	
	frequency	%	frequency	%
Labor	18	26.1	0	0.0
Agriculture	41	59.4	4	26.7
Service	1	1.4	4	26.7
Business	9	13.0	7	46.7
Total	69	100.0	15	100.0

Source: Questionnaire survey, 2016

e) Average demand of forest products

As we have seen in the Tab. 4-8, it was found 6 members in a average family. However, the number of family member ranges from 3 to 23. Some of the respondents were found in living with joint family system. Normally, the demand of timber and fuel wood depends upon not only in family size but also in the cooking habits (Arnold and Jongma, 1978). According to the survey, the average demand for timber was found 0.203 m³ and fuel wood was 1.15 m³ per family per year. Most of the respondents who live in municipal and market area they use other sources of energy for cooking rather than fuel wood.

表 4-8 森林产品的家庭平均规模和年需求量

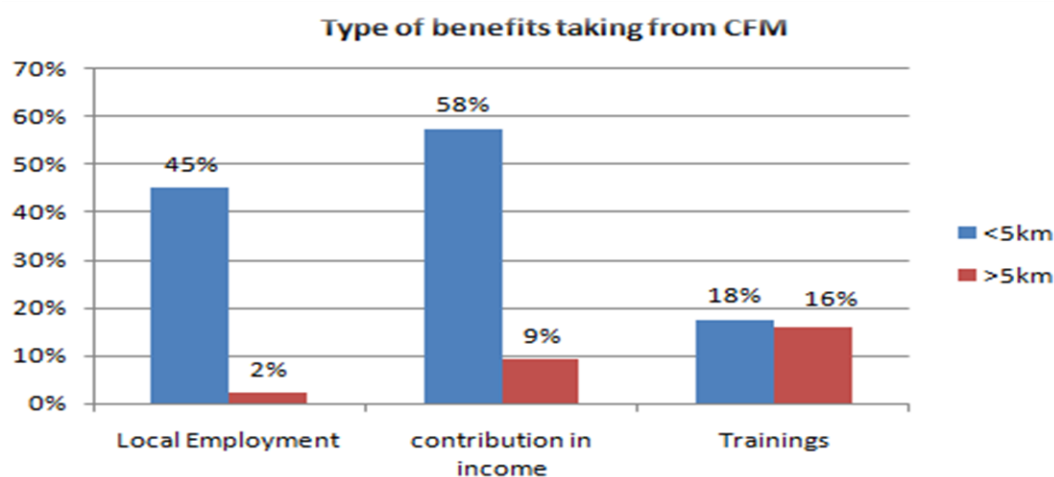
Tab. 4-8 Average family size and annual demand of forest products

	Family Size	Demand of Timber in (m ³)	Demand of Fuel-Wood (m ³)
Average	6.00 (Min-3; Max-23; Sd.- 2.79)	0.203	1.15

Source: Questionnaire Survey 2016

4.2.2 Benefits receiving by the respondents

All the respondents agreed that that are receiving forest products mainly timber and fuel wood from the CFM. They also granted that they don't have any other options for getting forest products rather than CFM. According to the study done by Bhattarai (2015), CFM not only can provide forest products but also can provide other benefits such as employment, subsidized loan, trainings, workshop, scholarship and indirect employments to the local people. Similarly, in this study it was found that peoples are only getting few benefits like local employment, contribution in income and trainings/workshops along with the forest products. However, subsidized loan and scholarship to the users is lacking in this area.



Source: Questionnaire Survey, 2016

图 4-12 从 TCFM 到距离类别的利益类型

Fig. 4-12 Type of benefits taking from the TCFM by distance category

The above figure (Fig. 4-12) shows that very few nearer and distant respondents (18% and 16%) had agreed of receiving training and workshop respectively. However, most of the nearer respondents agreed that they are getting local employment and wages from the CFM. Furthermore, about 58% of nearer respondents believed that CFM has contribution on their income generation directly or indirectly; whereas only 9% of distant users agreed on it. Correspondingly, the peripheral users had more benefit of getting local employment and wages from the CFM activities. About 45% of the respondents have agreed of getting local employment however, they argued that this kind of employment is not in regular basis, it is only a seasonal that they had got chance to get this benefit.

4.2.3 Perception on decision making process and benefit sharing mechanism

Respondents by well being category that is poor medium and rich agreed in different level to the decision making process and benefit sharing mechanism. It was found that in poor category most of respondents completely agreed on existing practice but from the rich and medium category most of the respondents agreed with some improvement in the mechanism. And, they suggest that improvement should be made in most of the decision making process about the fund mobilization. They showed their dissatisfaction regarding expenses of their income and doing process. It should be more transparence.

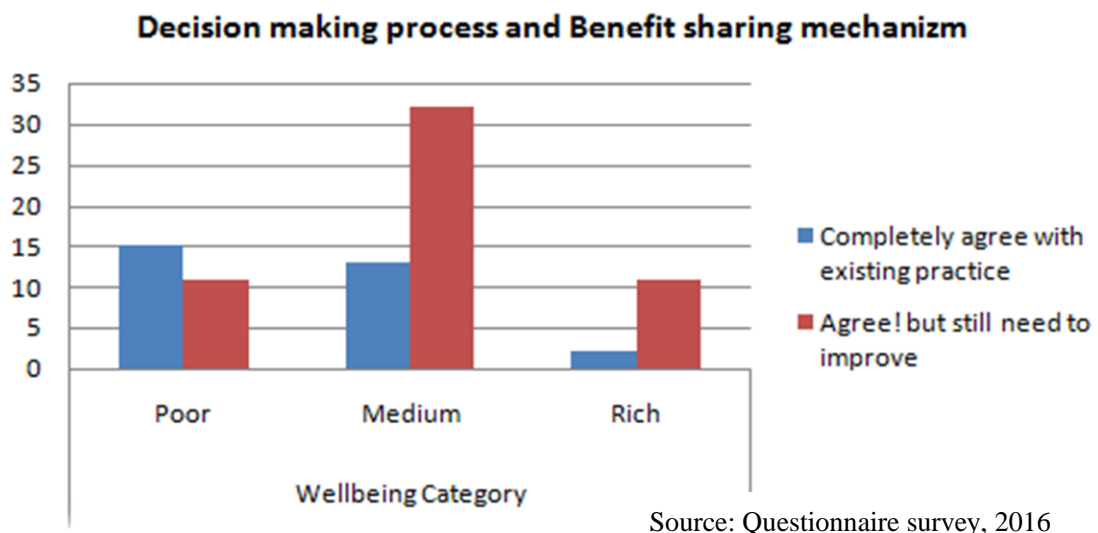


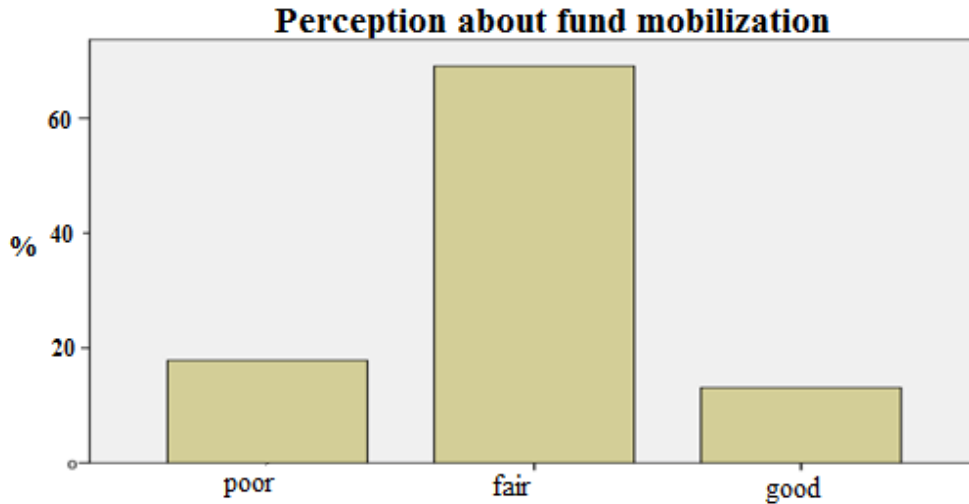
图 4-13 基于福利范畴的决策过程感知

Fig. 4-13 Perception on decision making process by well-being category

4.2.4 Perception on fund mobilization activities

As we have seen in the earlier section, TCFM makes a significant income on a yearly basis through the sale of timber and other forest products, and through memberships. This income is later used in forest management, pro-poor development, and community development among others. So, it is very obvious for an income level of such scale that all

those who are involved agree with the fund mobilization. However, in total around 20% of the respondents opined that the mobilization of the TCFM funds were poor, and thus needed an improvement (Fig. 4-14).



Source: Questionnaire Survey, 2016

图 4-14 人们对资金动员活动的认识

Fig. 4-14 Perception of people on fund mobilization activities

Majority of the respondents (around 70%) thought the fund mobilization was fair enough, and the rest opined that the mobilization was good and meet the expectations. It is not unlikely that these people who opine a poor fund mobilization are the same people who have little say in the CFM decision making, or think that the benefit distribution was not equitable.

表 4-9 人们对资金激励活动的感知

Tab. 4-9 Perception of people on fund mobilization activities by educational category

Perception on fund mobilization	illiterate		informal education		formal education	
	freq.	%	freq.	%	freq.	%
Poor	0	0.0	7	18.9	8	20.5
Fair	8	100.0	30	81.1	20	51.3
good	0	0.0	0	0.0	11	28.2
Total	8	100.0	37	100.0	39	100.0

Source: Questionnaire Survey, 2016

Furthermore, the perception toward existing fund mobilization mechanism was crosstab with the education level and it was found that almost all the illiterate users has opine as “fair”. However, both 20% formal and informally educated respondents respectively have opined as “poor”. Therefore, we can say there should be enough space to improve the fund mobilization activities. It was also verified during the key informant survey, some respondents also focused on the transparency in fund mobilization is not

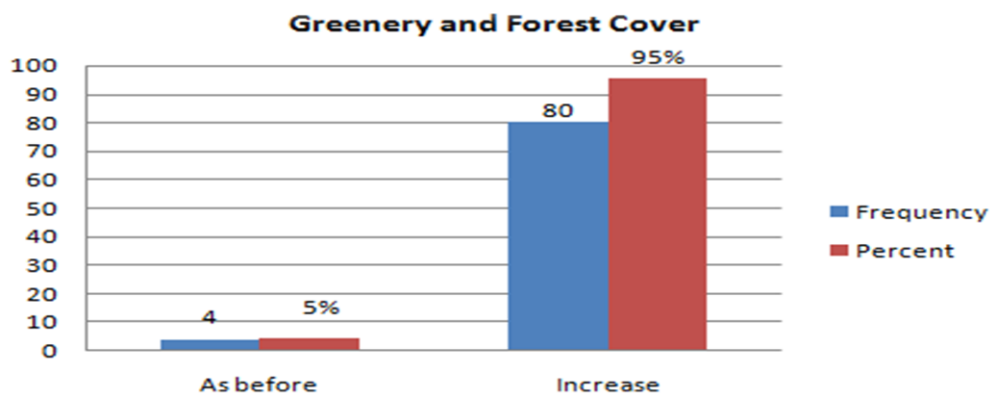
enough. And, there were no any considerable programs launched for income generation activities to enhance the livelihood of poor people by the collected fund. Some people doubt about, exactly where the fund has been mobilized.

4.2.5 User's perception regarding environmental contribution

The respondents were asked through structured questionnaire for their opinion on the contribution of existing practice. The contributions areas were decided by the pre-discussion with DFO staffs and key informants of TCFM. According to the areas mentioned in the questionnaire, the respondents had given their perception mainly framed four answers that is "Increasing", "Decreasing", "As before" and "Don't know". The findings are described as followings subheadings.

a) Maintenance of greenery and forest cover

The given Fig. 4-15 shows the percentage of respondents' response regarding the maintenance of greenery and forest cover after the implementation of CFM practice, almost 95% from both nearer and distant users believed that greenery and forest cover is increasing by this practice. Moreover, according to the key informant survey and focus group discussion; after the implementation of CFM program plantation had been done in some degraded site and uncontrolled grazing has been prohibited in plantation area. Similarly, district forest office has massive seedling production program from last few years. Moreover, promotion in regeneration has also increased the greenery and forest cover in the degraded areas. These evidences were also observed during field observation.



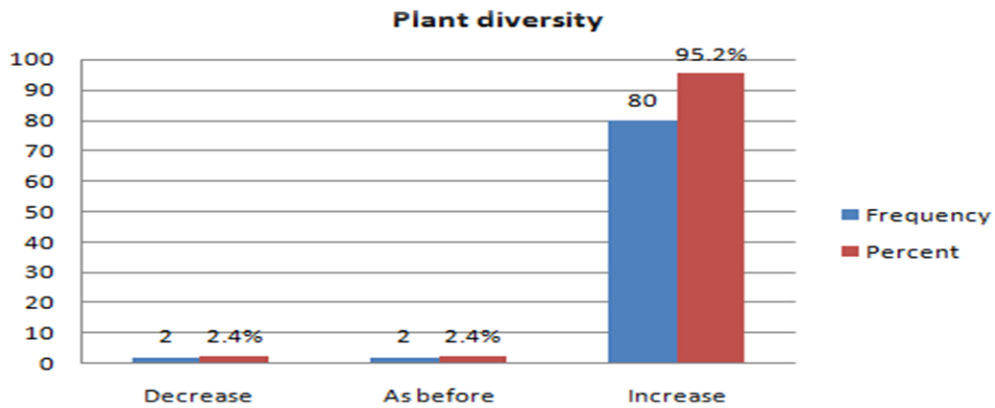
Source: Questionnaire Survey, 2016

图 4-15 关于养护绿化和森林覆盖率的看法

Fig. 4-15 Perception on maintenance of greenery and forest cover

b) Plant diversity

The view of the respondents on plant diversity is shown by following figure. It was found that majority of the respondents (95%) believed that the plant diversity is increased by the management practice in TCFM.



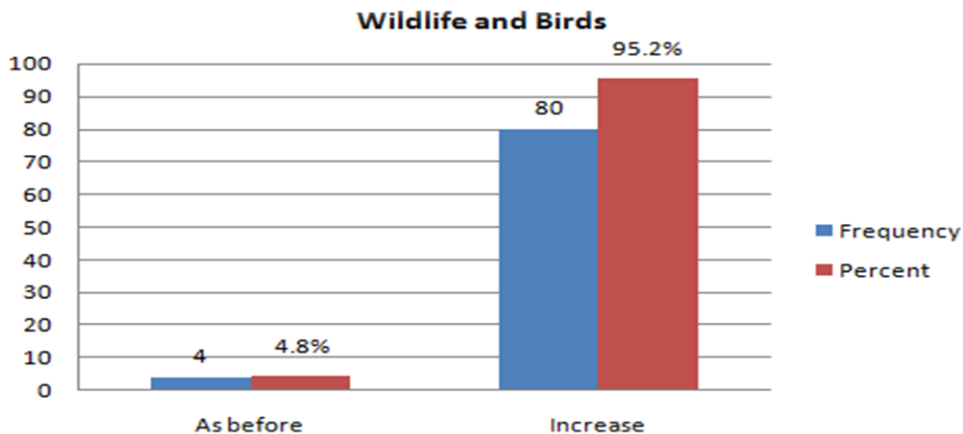
Source: Questionnaire Survey, 2016

图 4-16 对 TCFM 植物多样性的感知

Fig. 4-16 Perception toward plant diversity in TCFM

c) Wildlife and birds

Similarly, almost all the respondent believed that this practice has increased wildlife and birds that was also verified by the focus group discussion (discussion with the forest labor).



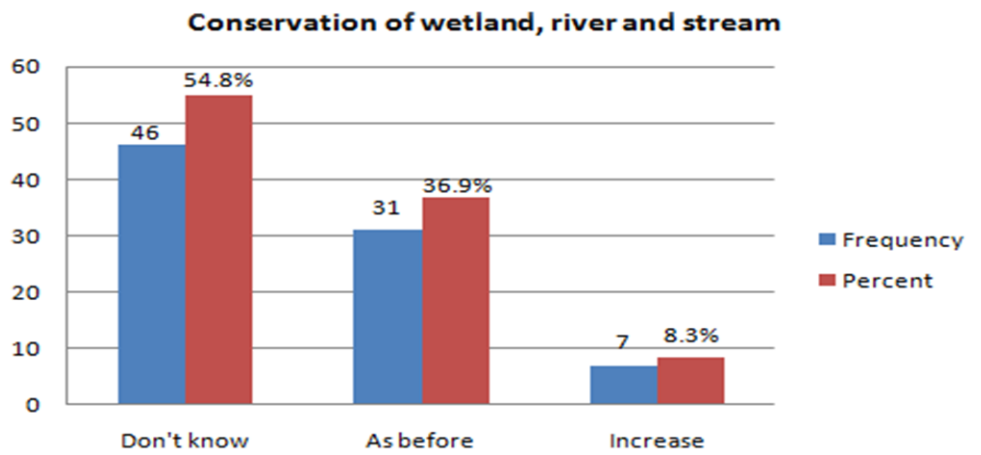
Source: Questionnaire Survey, 2016

图 4-17 人们对野生动物和鸟类的感知

Fig. 4-17 Perception toward Wildlife and Birds in TCFM

d) Conservation of wet land, river and stream

Although the most of the positive attributes were found increasing in people point view, the status of conservation of wetland, river and stream is unknown to the most of the respondents. However, very few (8.3%) people believe that it was increased by the TCFM practice. It was also verified with DFO progress report (DFO, 2016).



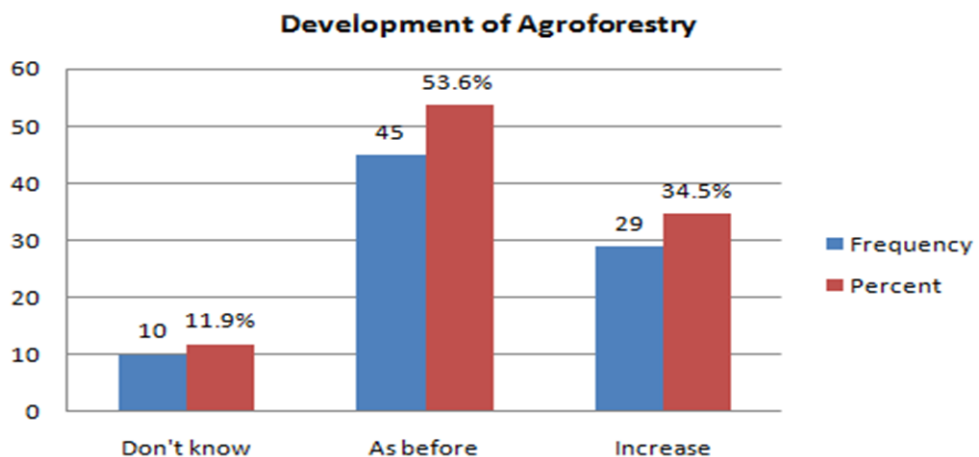
Source: Questionnaire Survey, 2016

图 4-18 TCFM 地区湿地、河流和溪流保护的认知

Fig. 4-18 Perception toward conservation of wetland, river and stream in TCFM area

e) Development of agro-forestry

More than 53% respondents thought that development status of agro-forestry in the society has not been changed. However, 34% of respondents believe that the implementation of CFM practice has increased the status of agro-forestry development in the community (Fig. 4-19). It was also verified by the TCFM office and DFO data, by that it was found that both the DFO and TCFM has established nursery to raise the seedlings and free distribution to the local community people who want to develop agro-forestry. But this kind of program was found not so intensive as a results most of the people's were seemed unaware to this program.

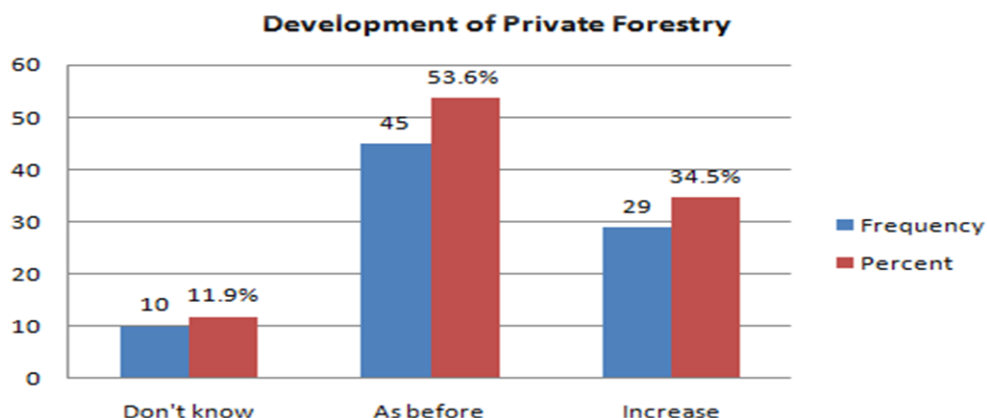


Source: Questionnaire Survey, 2016

图 4-19 对社区农业林业实践发展的认识

Fig. 4-19 Perception toward development of agro-forestry practice in community

f) Development of private forestry



Source: Questionnaire Survey, 2016

图 4-20 对社区农业林业实践发展的认识

Fig. 4-20 Perception toward development of agro-forestry practice in community

Similarly, the development of private forest is also assumed as an attribute for environmental contribution of TCFM program in this study. The result shows that more than 53% respondents thought that the status of development of private forestry has not been changed. In contrast, 34% of respondents believe that the implementation of TCFM practice has positive impact on the development of private forestry in the community (Fig. 4-20).

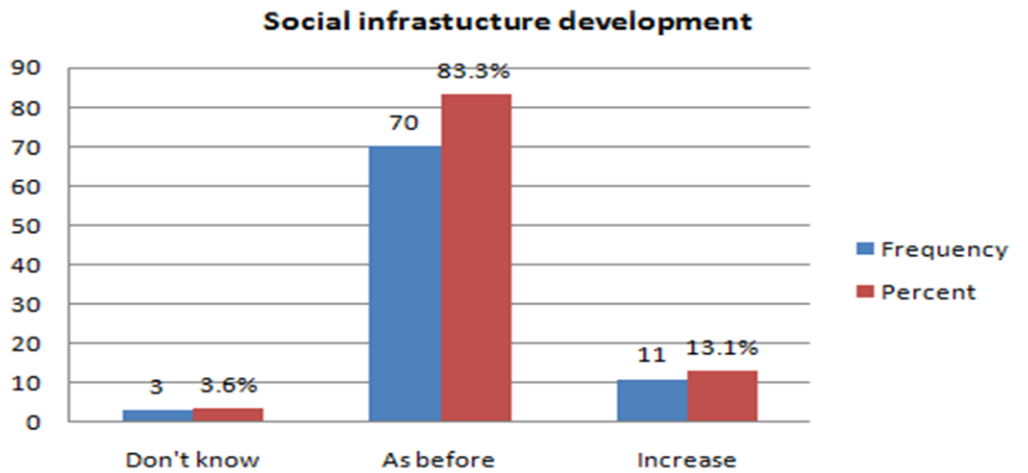
g) Other attributes: For the other attributes such as regeneration status, illegal felling control, encroachment control and forest fire control in are increasing by the point view of all the respondents. And it was also verified by the key informant survey and field observation.

4.2.6 User’s perception regarding Socio-economic contribution

As done to know the perception toward the environmental contribution same was done to know the people’s perception regarding socio-economic contribution of CFM practice. To acquire the people’s opinion it was broken down in many headings/attributes as mentioned below that were decided by the pre-discussion with DFO staffs and key informants. According to the headings the respondents had given their perception mainly framed on four perceptions that is “Increasing”, “Decreasing”, “As before” and “Don’t know”. People’s perception on some headings such as Job creation and livelihood support; Fulfillment of forest products; Forest based jobs, forest based industries, awareness of people, leadership development and revenue collection from forest; is increasing, because almost all the respondents (more than 95%) agreed that the existing practice in TCFM has contributed increase such socio-economic parameters. Perception on other title is described as following.

a) Social infrastructure development

In the case, development of social infrastructure, more than 83% people believed that it same as before, whereas, only 13% people agreed on the development of social infrastructure increased by the CFM practice in Tilaurakot.



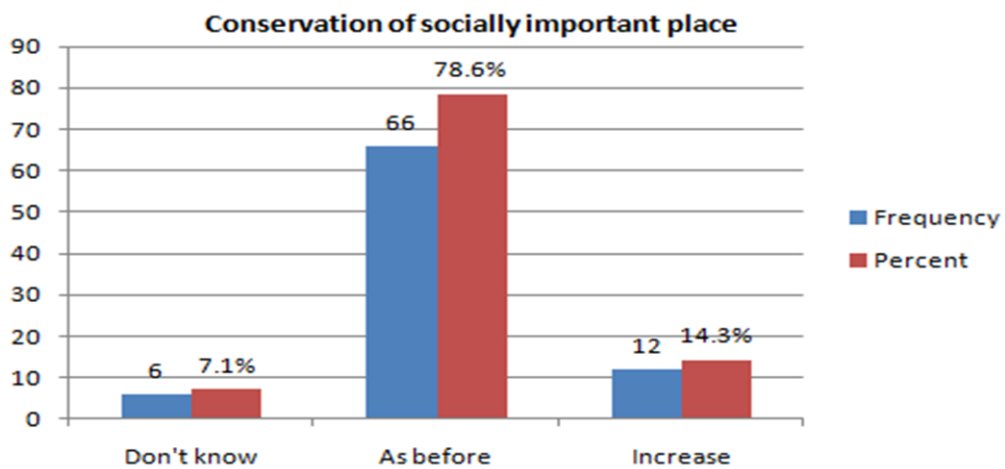
Source: Questionnaire Survey, 2016

图 4-21 对社会基础设施发展的看法

Fig. 4-21 Perception toward social infrastructure development

b) Conservation of socially important place

Most of the respondents believe that TCFM practice has no any contribution in the conservation of socially important place. The status of conservation of socially important place was found.



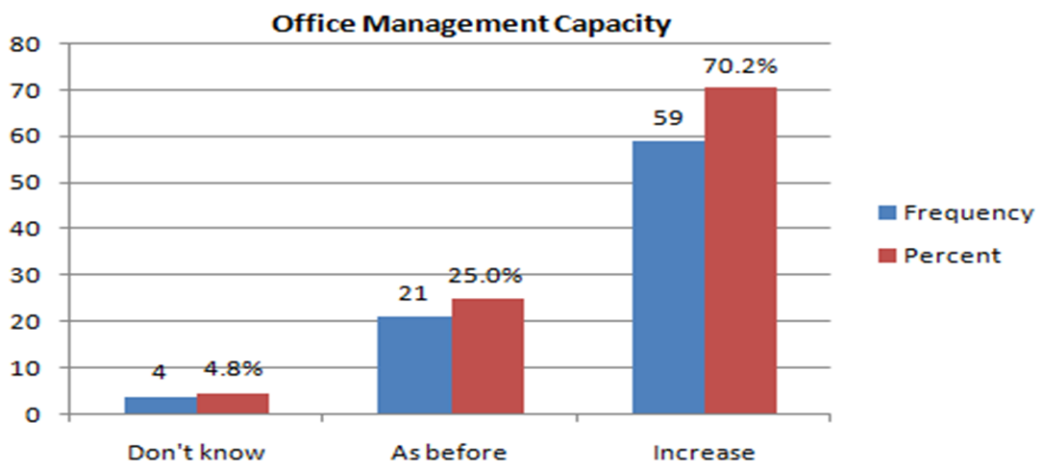
Source: Questionnaire Survey, 2016

图 4-22 对社会重要地方保护的感知

Fig. 4-22 Perception toward conservation of socially important place

c) Office management capacity

About more than 70% respondents agreed that the office management capacity of TCFM has been increased after the implementation of TCFM plan.



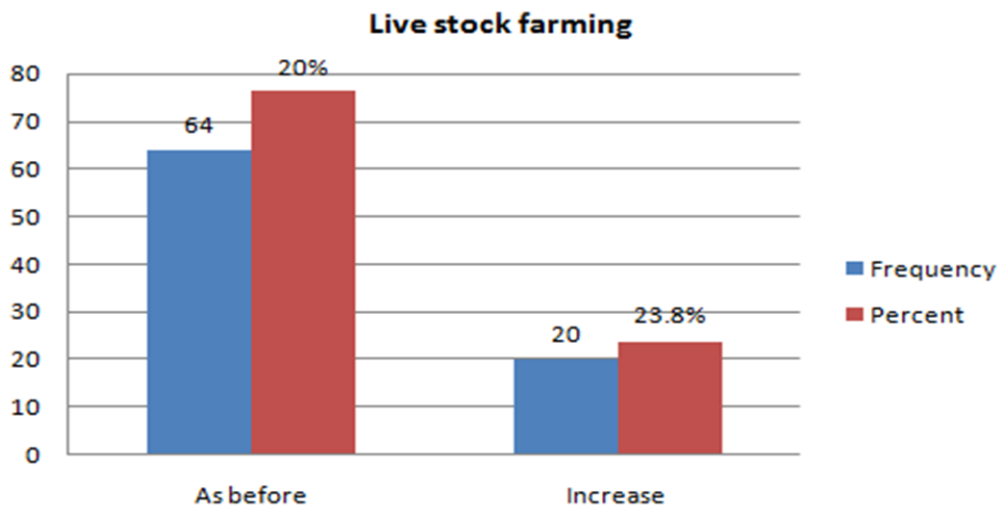
Source: Questionnaire Survey, 2016

图 4-23 对政府管理能力的感知

Fig. 4-23 Perception toward office management capacity

d) Livestock farming due to TCFM

However, the perception towards the status of livestock farming was appeared same as before. By this result it can be concluded that TCFM practice hasn't make any contribution in Live-stock farming by the people perspective.



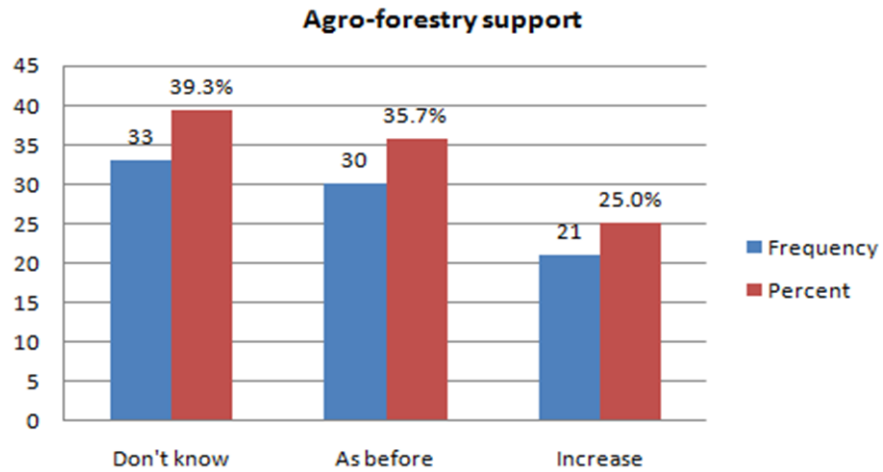
Source: Questionnaire Survey, 2016

图 4-24 对 TCFM 畜牧养殖现状的态度

Fig. 4-24 Perception toward status of livestock farming in TCFM group

e) Agro-forestry support

The result found very conflicting views on another attributes (Agro-forestry support) for the socio-economic contribution. Most of the people (40%) were not aware about the agro-forestry support. Whereas, 35% people believed that there was no any change found due to the TCFM implementation.



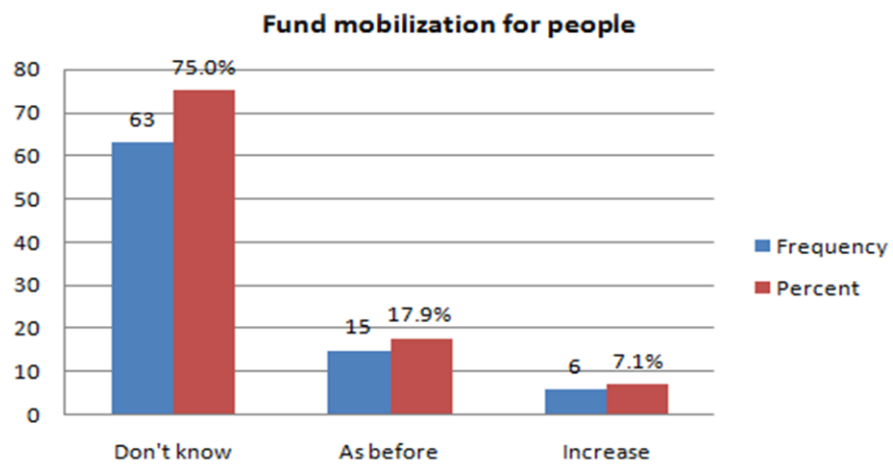
Source: Questionnaire Survey, 2016

图 4-25 对社区农业林业扶持的态度

Fig. 4-25: Perception toward support for agro-forestry in the community

f) Fund mobilization for the local people

About 70% people were found unknown about the fund mobilization activities however, very few (7%) people believed that fund mobilization for the local people is increased.



Source: Questionnaire Survey, 2016

图 4-26 人们对资金动员的认知

Fig. 4- 26 Perception toward fund mobilization for people

g) Other attributes:

Other attributes like local employment, awareness of the people, leadership development in the society, revenue collection from the forest are increased in the view point of all the respondents. That can evaluate the socio-economic contribution of the TCFM practice were found increased in point view of respondents.

4.2.7 Frequency and Likert Score for Perception of Users regarding existing TCFM practice

The following table (Tab. 4-10) presents the frequency and Likert scores on the perceptions of users based on the questionnaire survey administered to 84 respondents. The interpretation was done according to the Tab. 3-2 in section 3.2.2.

表 4-10 用户对现有 TCFM 实践的感知频率和李克特分数

Tab. 4-10 Frequency and Likert Score for Perception of Users regarding existing TCFM practice

variables	Rank wise Frequency					Total no weight	Likert Score (%)	Interpretation
	HD (1)	D (2)	MA (3)	A (4)	SA (5)			
Forest Product extracted from TCFM have reached to distant users	0	0	14	50	20	328	78.10	Good
Illegal felling and extraction has been fully controlled	0	0	8	72	4	324	77.14	Good
Forest fire has been fully controlled	0	0	4	78	2	330	78.57	Good
Effective protection from encroachment	0	0	0	75	9	345	82.14	Good
Local employment is generated	0	0	59	25	0	218	51.90	Medium
Forest Management activities has increased in regeneration	0	0	30	54	0	276	65.71	Good
CFM plan is implemented with the Coordination and cooperation of stakeholders	0	0	33	51	0	270	64.29	Medium
Common understanding and commitment has developed among the stakeholders	0	0	40	44	0	256	60.95	Medium
CFM program is running in a right way and satisfactory	0	0	27	57	0	282	67.14	Good
Income generation activities for users have increased through CFM	0	42	39	3	0	174	41.43	Weak*
Overall forest condition and health is improving	0	0	18	64	2	302	71.90	Good
Existing TCFM practice will address most of the problems and create opportunities	0	0	9	75	0	318	75.71	Good

Note: HD- Highly Disagree; D- Disagree; MA- Moderately Agree; A- Agree; SA-Strongly Agree

Source: Questionnaire survey, 2016

Most of the responses are aligned towards 4th rank (agree) and the most of the Likert Scores are higher than average. It was found to be a good perception toward the CFM practices in on average. Therefore, it can be concluded that TCFM practice is satisfactory but there is still room for improvement in people's perspectives. Moreover, the level of common understanding and coordination with local stakeholder is ranked as medium that means it was not dissatisfactory but there remain many things to improve. Besides, the overall perception of the users toward the "Income generation activities for users have increased through TCFM" was found as weak that means unsatisfactory and needs excessive improvement. In contrast, there was some findings mentioned above that TCFM practice have increased employment activities. However there was no any conflict between these two activities, of course this program has created many job opportunities. However, these statements has focused on the different Income Generation Activities (IGA) that was created or implemented for the users, such as, subsidized loan to poor families inside the TCFM group, hand craft training and financial support for it, support in livestock farming, support in non timber forest cultivation etc. This portion was found ranked as weak.

4.2.8 Mann Whitney U test to compare the perception of two groups by distance

We had ranked scored ordinal data that could be used to compare the perception of two different groups of people towards different statements that is used for calculating perception by using Likert scale as in section 4.2.7. The peoples are categories in two group by distance category that is "Nearer" (<5Km) and "Distant" (>5Km) users statistically compared on the basis of ranked score assigned to each statement.

Hypothesis testing:

H0: The distribution of scores for the two groups is equal.

H1: The distribution of scores for the two groups is not equal

The findings in Tab. 4-11 reveals the results of Mann Whitney U test for the "Forest product reach to distant users" scores of the people in the less than 5km and more than 5km distance from the forest did not show any statistical difference ($Z=-0.653$; $p=.514>.05$). The rank average of the FP reach to distant users of the people less than 5km from forest was 40.90, while the people of more than 5km distant from forest had score rank average of 43.95.

Similarly, the results of the Mann Whitney U test applied to the statement "illegal feelings has been controlled" scores of the person living less than 5km distant and more than 5km distant revealed a statistically significant difference at the level of 1% ($Z=-2.589$; $p=.004<.01$). The rank average of the its scores of the less than 5km group people from forest was 47.35, while the people of more than 5km from forest scored core rank average of 38.09. The analyses had shown significant difference between the rank averages of the perception of two groups. The same test on the statement "Forest fire has been fully

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controlled” and “Effective protection from encroachment” was also found significantly different between two category people. The nearer people agreed more than distant people towards this statement. Further, nearer people agreed more on “Forest Management activities have increased in regeneration”. It may be generalized like that the nearer people are more aware about the regeneration increase in the forest after management activities started. Moreover, the distant people believe more on CFM program has enabled the good environment for coordination amongst the stakeholders and they also believed more that there is good level of common understanding between the stake holders.

表 4-11 通过 Mann Whitney U 检验比较两组对距离的感知

Tab. 4-11 Result of Mann Whitney U test to compare two groups’ (<5km and >5km) scores for different variables

variables	distance	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	P-value																																																																																																																																										
Forest Product extracted from TCFM have reached to distant users	<5km	40	40.90	1636.00	816.000	1636.00	-.653	.514																																																																																																																																										
	>5km	44	43.95	1934.00					Illegal felling and extraction has been fully controlled	<5km	40	47.35	1894.00	686.000	1676.00	-2.859	.004	>5km	44	38.09	1676.00	Forest fire has been fully controlled	<5km	40	45.50	1820.00	760.000	1750.00	-2.408	.016	>5km	44	39.77	1750.00	Effective protection from encroachment	<5km	40	46.40	1856.00	724.000	1714.00	-2.608	.009	>5km	44	38.95	1714.00	Local employment is generated	<5km	40	42.60	1704.00	876.000	1866.00	-.045	.964	>5km	44	42.41	1866.00	Forest Management activities have increased in regeneration	<5km	40	50.15	2006.00	574.000	1564.00	-3.302	.001	>5km	44	35.55	1564.00	CFM plan is implemented with the Coordination and cooperation of stakeholders	<5km	40	40.10	1604.00	784.000	1604.00	-1.016	.309	>5km	44	44.68	1966.00	Common understanding and commitment has developed among the stakeholders	<5km	40	34.15	1366.00	546.000	1366.00	-3.458	.001	>5km	44	50.09	2204.00	CFM program is running in a right way and satisfactory	<5km	40	38.15	1526.00	706.000	1526.00	-1.926	.054	>5km	44	46.45	2044.00	Income generation activities for users have increased through CFM	<5km	40	49.40	1976.00	604.000	1594.00	-2.808	.005	>5km	44	36.23	1594.00	Overall forest condition and health is improving	<5km	40	46.00	1840.00	740.000	1730.00	-1.694	.090	>5km	44	39.32	1730.00	Existing TCFM practice will address most of the problems and create opportunities	<5km	40	41.75	1670.00	850.000	1670.00	-.502
Illegal felling and extraction has been fully controlled	<5km	40	47.35	1894.00	686.000	1676.00	-2.859	.004																																																																																																																																										
	>5km	44	38.09	1676.00					Forest fire has been fully controlled	<5km	40	45.50	1820.00	760.000	1750.00	-2.408	.016	>5km	44	39.77	1750.00	Effective protection from encroachment	<5km	40	46.40	1856.00	724.000	1714.00	-2.608	.009	>5km	44	38.95	1714.00	Local employment is generated	<5km	40	42.60	1704.00	876.000	1866.00	-.045	.964	>5km	44	42.41	1866.00	Forest Management activities have increased in regeneration	<5km	40	50.15	2006.00	574.000	1564.00	-3.302	.001	>5km	44	35.55	1564.00	CFM plan is implemented with the Coordination and cooperation of stakeholders	<5km	40	40.10	1604.00	784.000	1604.00	-1.016	.309	>5km	44	44.68	1966.00	Common understanding and commitment has developed among the stakeholders	<5km	40	34.15	1366.00	546.000	1366.00	-3.458	.001	>5km	44	50.09	2204.00	CFM program is running in a right way and satisfactory	<5km	40	38.15	1526.00	706.000	1526.00	-1.926	.054	>5km	44	46.45	2044.00	Income generation activities for users have increased through CFM	<5km	40	49.40	1976.00	604.000	1594.00	-2.808	.005	>5km	44	36.23	1594.00	Overall forest condition and health is improving	<5km	40	46.00	1840.00	740.000	1730.00	-1.694	.090	>5km	44	39.32	1730.00	Existing TCFM practice will address most of the problems and create opportunities	<5km	40	41.75	1670.00	850.000	1670.00	-.502	.616	>5km	44	43.18	1900.00								
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Source: Questionnaire survey, 2016

It was also found that there is highly significant difference between two groups of people on statement “Income generation activities for users have increased through CFM”. Nearer

people believed more on “CFM has increased income generation activities” however the distant users did less agree on it. In another hand, there is no doubt that the CFM has increased the Job in the forest in that statement there was no any significant different between two groups ($p=.964$; $p<0.05$). More clearly, both groups strongly believe that CFM practice has increased the Job opportunity, the job was mainly as labor for timber collection and distribution. But, it was also asked during the survey about the other income generation activities (IGA), which was weakly scored found. Further, the information from the focus group discussion and key informant survey has also supported these findings. The study carried out by Bhattarai (2015) in Rupandehi district also found that nearer people get more job opportunities than distant users.

4.2.9 Statistical comparison of benefits taking between two groups

As we have mentioned previously users have been taken bundles of benefits from the TCFM after the implementation of this management practice. The type of benefits are varied, amongst bundles of benefits all of the respondents have agreed on taking forests products such as timber and fuel wood from the forest. Besides these benefits, majority of people have mentioned about the other benefits such as employment, contribution of CFM in their income and human resource development activities like training, workshop, and study tour during the questionnaire survey. Among many benefits not all the benefits are taken from all respondents, from two different distance category may have get chance of taking different benefits. To test if there is any significance difference between the different benefits from forest with two groups of population nearer (<5km) or Distant (>5km) from forest Pearson chi square test was done that shows as following.

Hypothesis testing:

H0: There is no significance relationship between dependent and independent variables.

H1: There is significance relationship between dependent and independent variables.

表 4-12 chi-square 测试的结果显示出两个小组之间由距离导致的不同获益

Tab. 4-12 Results of Chi-square test for benefits from the forests between two groups by distance

Benefits from forest	<5km (Nearer)	>5km (Distant)	Pearson chi square	P-value
Employment	45%	2.30%	21.854	0.0001
Contribution in income	57.50%	9.10%	22.512	0.0001
Trainings, Workshops, Study tours	17.50%	15.90%	0.038	0.845

From the above table by using the chi-square test it has been revealed that there is highly statistical significant difference at 1% level between two groups(<5km and >5km) for getting employment and contribution in income as benefits from the TCFM forest. But there is no significance difference between these groups for training. Since chi square test

does not give the magnitude of the difference. Therefore, for further bivariate analysis we use the binary logistic regression model (Tab. 4-13 and Tab. 4-14).

Hypothesis testing:

H0: There is no significance relationship between dependent and independent variables.

H1: There is significance relationship between dependent and independent variables.

表 4-13 逻辑回归 1: 就业作为因变量

Tab. 4-13 Logistic regression1- *Employment* as dependent variable

Independent variable	B	S.E	Wald	p-value	Exp(B)
Distance of the users (<5km) or (>5km)	3.561	1.06	11.276	0.001	35.182

表 4-14 逻辑回归 2: 收入的贡献作为因变量

Tab. 4- 14 Logistic regression2- *Contribution in income* as dependent variable

Independent variable	B	S.E	Wald	p-value	Exp(B)
Distance of the users (<5km) or (>5km)	2.605	0.614	17.984	0.0001	13.529

In Tab. 4-13 logistic regression model is used to compare the contribution in employment for two different groups (<5km or >5km). Since we have use Nearer (<5km) as a reference variable hence above table can be interpreted as the people who live less than 5km from forest have 3.56% more employment by help of forest as compared to the people of more than 5km from forest. Since P-value is less than 0.01. Thus result is highly statistically significant at 1% level. Similarly, from the Tab. 4-14 it can be concluded that the people of less than 5km distance from forest have 2.065% more contribution in income than the other group, i.e. more than 5 km.

4.3 Sustainability assessment of CFM by using Sustainability index

As it was mentioned in previous section (3.2.2) the sustainability of TCFM was assessed by using 4 Criteria; 26 indicators; and 60 verifiers as shown in *Appendix: II*. By the analysis of scores of the verifiers for all indicators under each criterion, the average scores of the verifiers for each criterion were calculated at first to assess the general status (irrespective to the given weight) of each criterion (Fig. 4-27). After that, it can be further calculated respective to the given weight) given to the each criterion to assess the sustainability index of individual Criteria (SIIC) (Fig. 4-28). And, finally, from the SIIC of each criterion, the overall sustainability index (OSI) was calculated.

According to the figure (Fig. 4-27), average scores of the verifiers for three criteria were found more than 2.00, where the highest value for each verifier was 3.00; this can be explained as a good status for the sustainability. However, the one criterion named “economic and social benefits” was found below 2.00, it can be explained that it needs some improvement in this sector. It can be also explained like; although the CFM practice

has provided loads of economic and social benefits, it has still not satisfied all the potential desires and achievements. In addition, by the key informants and focus group discussion, it was found that some of activities prescribed by management plan such as regeneration promotion and thinning were not met due to various reasons; such as, lack of initial budget to implement, lack of clear cut norms and guidelines. If it would be fully implemented more revenue could be collected by which income generation programs for the users could be initiated.

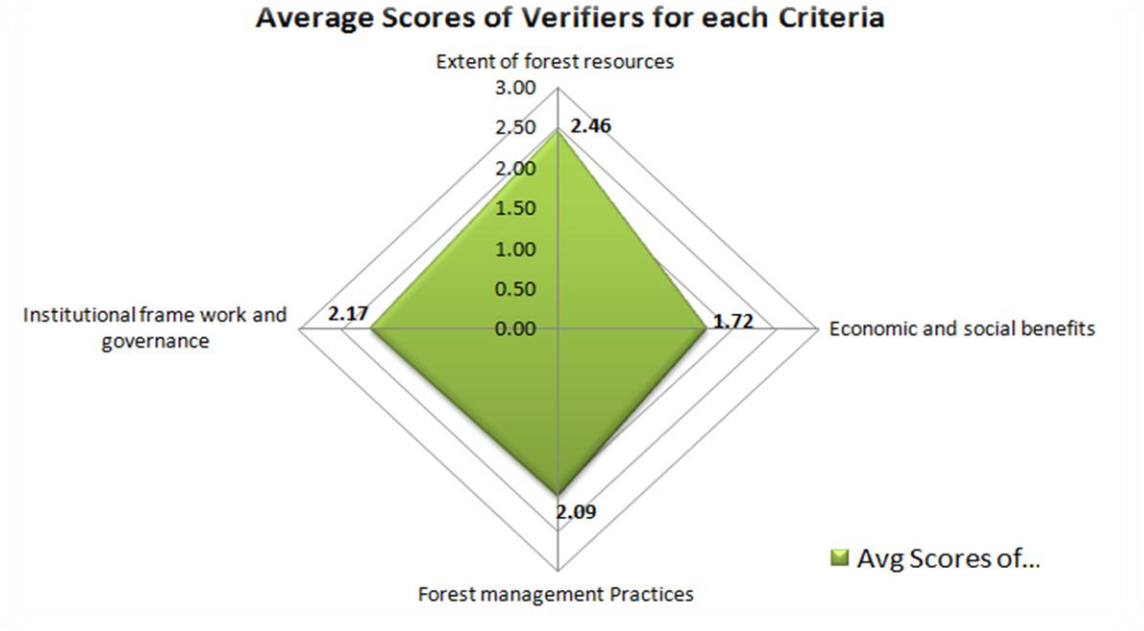


图 4-27 每项标准的核查员平均打分

Fig. 4- 27 Average Score of Verifiers for each Criterion

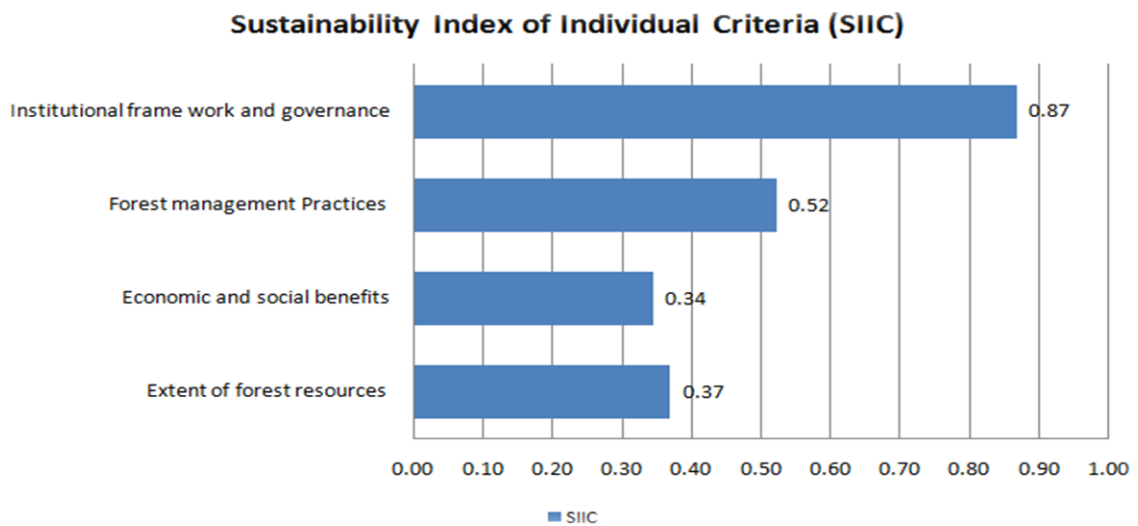


图 4-28 个人标准的可持续性指数 SIIC

Fig. 4- 28 Sustainability Index of Individual Criteria (SIIC)

Furthermore, on the basis of importance for the sustainability all the criteria were assigned weight to calculate the weighted scores of verifiers to calculate the SIIC and OSI. In addition, the above graph also shows the value of SIIC for each criterion that was calculated by weighted scores of verifiers. It ranges from 0.34 for Criteria: Economic and social benefits; and, 0.87 for Criteria: Institutional framework and governance. The detail on assessment of sustainability is attached in (*Appendix: VI*).

Overall Sustainability Index (OSI) was calculated and found as 0.53. That can be interpreted as TCFM is moving toward the sustainability, because the overall index (OSI) was found more than 0.50 (Pokharel, et al., 2014). Simply, it can be assumed that the higher OSI indicates more chances for achieving sustainability. Whereas, Pokharel and Larsen (2009) prescribed the OSI value equal or more than 59 as a limiting value for achieving the sustainability. Moreover, the OSI of TCFM was found comparatively higher than in two Collaborative Forests, study did by Pokharel et al, (2014). In their study they had used the same model to assess the sustainability and found OSI, 0.49 in Halkhorja CFM and 0.46 in Sahajnath CFM in Bara District, Nepal. Hence, it can be said that the TCFM is in the way of sustainability, however still there are some areas to be improved to assure the sustainability.

As a final point, it can also be justified by the results found in previous sections of this chapter. The results have shown that CFM practice in Tilaurakot has performed to provide bundles of comprehensive benefits mainly in social, economical and environmental aspects, which are the most important attributes for the sustainable forest management. Therefore, the overall results of the study also support the finding in this section that this forest is on the track of sustainability. However, it has also shows that some criteria are still needed improvements to ensure and enhance the sustainability.

5 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Altogether 2.3 million hectare forest covering over 38% of total forest area of the Nepal is being managed by the local communities under Community Based Forest Management scheme of which over 60 thousands hectares of forest area is currently managed as Collaborative Forests primarily in the southern plains (Terai) of Nepal. This management modality is second largest CBFM program in Nepal benefiting over half a million households .Large blocks of forests managed as Collaborative Forests have great significance in enhancing the socio-economic and environmental condition of the local people and society in the Terai region of the country.

The focus of the study remained on the contribution of existing CFM practice in terms of revenue collection for government and the users' group, generation of forest based income and employment opportunities, supply of forest products and other social support and development. From the compilation and analysis of available data it can be concluded that CFM practice in the study area (Tilaurakot CFM) has done remarkable contribution on socio-economic as well as environmental aspects. The results have shown that after the implementation of CFM plan, it has amplified the continuous flow of forest products to the users, regardless of their household distance from forest. The number of households benefitted by the forest product has shown increasing trend in last 5 years of implementation. Meanwhile, it has created many employment opportunities for the local people as well as forestry technician and experts. The results show that TCFM has contributed to create annual job for more than 20 thousands man days in average that was equivalent to more than 56 thousands US\$ to the date. Remarkably, the job is mainly provided to the local labor for forest product collection. However, the potential of the CFM to provide the employment to the local people by involving them in forest based industries, and encourage local people by providing financial support for other income generation activities have not been fully realized yet. Nevertheless, the CFM is able to generate a significant amount of revenue to the local communities without decreasing the revenue flow of the government. Besides these socio-economic contributions, the CFM equally has a significant contribution to improving the regeneration status of the forest as well as to maintain the age gradation of the forest after the implementation of series of management activities. Moreover, the CFM practice has assured the protection from illegal activities that destroy the forest and control from the forest fire. Therefore, it can be stated with absolute confidence that the CFM contributed not only to improving socio-economic status of people but also to improving ecological condition of the forests.

The local people generally have a positive attitude towards the existing forest management practices. Most of the people believe that CFM practice has not only increased the flow of forest products to the both near and distant users, but also has

increased the flow of revenue to the both the users group as well as the federal government. There is a general agreement among the local users that CFM practice has increased the local job opportunity. However, it is found out that there are several other income generation opportunities for the users that have not been explored and tried, but no actions are currently directed towards exploiting those opportunities. There is also an apparent incommensurateness to the distribution of income generation opportunities between the near and distant users which is reflected in the fact that proportionately more near users were employed in forest related jobs than the distant users. Therefore, the perception of both distance categories in this matter was highly significant.

The sustainability of forest is judged on three major sustainability attributes: economic, social, and ecological. This study finds that the CFM practice strives to keep a balance on these three attributes in an attempt to attain sustainability. The sustainability assessment of Tilaurakot CFM shows that it is heading towards the sustainability. The overall sustainability index (OSI) was 0.53 (>50) indicating TCFM is in right way to achieve the sustainability, however it needs some improvement under some indicators to assure and maintain the sustainability. Further, the Sustainability Index of Individual Criteria (SIIC) has shown better status of each individual criterion. It has suggested that economics and social benefits need to be improved to assure the sustainability.

5.2 Recommendation

This study focused on explorative and descriptive evaluation of the socio-economic and environmental contribution of CFM and could not discretely and quantitatively assess the contribution CFM has made to each component of the livelihood capital of local users, and in turn the impact of users' livelihood capital on forest and biodiversity. Therefore further studies should be focused on the measurement of CFM's contribution on overall livelihood wellbeing of users and ecological wellbeing of forests and society as a whole. This study is based on information collected from key informant interview, compilation of secondary data available in TCFM group and DFO and questionnaire survey for analyzing the people's perception on CFM practice. For the better comparison there was lack of baseline data before the implementation and thus control groups were not assigned. Future studies should therefore attempt for counterfactual analysis by assigning control and treatment groups and use baseline data for more reliable comparison.

The existing practices of the CFM users point toward sustainability; however, there are still many areas to be improved, such as economics and social benefits should be enhanced by launching relevant income generation activities for the users. There were more possibilities to increase the local employment for the users by promoting the forest based industries. It was found some lacking in the implementation of management plan in full phase; it should be prioritized to implement the plan in full phase in the future.

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APPENDICES

Appendix-I: Checklist for the data collection from the records keeping of TCFM group

1. Forest product, Direct Jobs and Revenue

Fiscal Year	Timber (m ³)	Fuel wood (M ³)	Direct Job Creation (Man Days)	Revenue to the Government	Revenue to the Community

2. CFM group fund mobilization and Capacity building

Fiscal year	Scholarship provided (No/Indv.)	Loan provided for IGA (No/indv.)	participants in Training, WS & Study Tour		

3. Infrastructure development (by the CFM group)

SN	Infrastructure	Quantity/Unit	Remarks
1	Forest Fire-line		
2	Road		
3	Fencing		

4. Regeneration status at starting (per hectare), No of Seedlings:..... No. of Sapling:.....

5. Present regeneration status (per hectare) No of Seedlings:..... No. of Sapling:.....

SN	Activities	Quantity/Unit	Remarks
1	Nursery Establishment/No	
2	Seedling production/No	Plantation:...../Distribution.....
3	Forest Fire frequencies		No, per year
4	Illegal felling frequencies		(tree/year)
5	Forest Encroachment land recovery		

Appendix-II: Criteria and indicators to evaluate sustainability of CFM practice

Criterion1: Extent of forest resources (focus on environmental condition)		
Indicators	Verifiers	Scoring
Forest condition	Composition of tree species	Poor = one tree species in the forest
		Fair = 2-3 tree species in the forest
		Good = >3 tree species in the forest
	Regeneration status	Poor = <2000 seedlings/ha
		Fair = 2000-5000 seedlings/ha
		Good = >5000 seedlings/ha
	Trees with different age classes	Poor = one age class trees(matured/young/pole)
		Fair = two age class (either matured and young; young and pole; matured and pole)
		Good = all age classes(matured/young/pole)
	Canopy cover of forest	Poor = < 39 % of canopy cover
		Fair = 40-70 % of canopy cover
		Good = >70 % of canopy cover
	Good shape trees in forest	Poor = <20% of good shape trees
		Fair = 20-40 % of good shape trees
		Good = >40% of good shape trees
Forest area covered with destructive weeds and climber	Poor = > 40% of forest area	
	Fair = 20-40% of forest area	
	Good = < 20 % of forest area *	
Forest growth and harvest	Amount of timber and fuel wood harvested in a year	Poor = > harvestable amount in a year
		Fair = equal to harvestable amount in a year
		Good = < harvestable amount in a year **
Greenery	Number of springs in forest	Poor = no spring in the area
		Fair = one spring in the area
		Good = > one spring in the forest
	Vegetation in the area	Poor = <20% of vegetation in the area
		Fair = 20-39 % of vegetation in the area
		Good = 40% and higher of vegetation in the area
Coverage in forest ground	Open area in forest floor	Poor = > 50 % of forest floor open
		Fair = 25-50% of forest floor open
		Good = < 25 % Of forest floor open
Changed forest area over time	Changed forest area into other land use over time	Poor = >10% changed in forest area
		Fair = 10% and lower changed in forest area***
		Good = No changed in forest area
Wildlife in forest	Occurrence of wildlife	Poor = never appeared
		Fair = 10 times and less appeared in a year
		Good = >10 times appeared in a year
	Livestock killed/attacked	Poor = never attacked / killed
		Fair = attacked/killed occasionally(3 times/yr or less
		Good = attacked/killed frequently(> 3 times/yr)

Note: poor = 1, fair = 2, and good = 3; * = 80% of forest coverage is considered as good; ** = inventory in Nepal is less likely to be accurate; *** = manageable

Criterion 2: Economic and social benefits (focus to socio-economic aspects)		
Awareness of people	Households showed up	Poor = up to 25% of the HHs

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towards the importance of forestry	voluntarily to participate in forest related works	Fair=26-50 % of the HHs
		Good= >50% of the HHs
	Number of meeting conducted	Poor = no awareness meeting in a year
		Fair= one awareness meeting in a year
		Good= > one awareness meeting in a year
	Trees on private land	Poor = 10% and less HHs planted trees
		Fair=11-30 % HHs planted trees
		Good= >30% HHs planted trees
Participation of people in forestry works	Households showed up in general assembly	Poor = up to 50% of the HHs
		Fair=51-75 % of the HHs
		Good= >75% of the HHs
	Households in forest management activities	Poor = up to 25% of the HHs
		Fair=26-50 % of the HHs
		Good= >50% of the HHs
Access to benefits	Households obtained benefits	Poor = up to 25% of the HHs
		Fair=26-50 % of the HHs
		Good= >50% of the HHs
Distribution of benefits	Poor / marginalized households received benefits	Poor = up to 25% of the poor HHs
		Fair=26-50 % of the poor HHs
		Good= >50% of the poor HHs
	Wood received by forest dependent people	Poor = up to 25% of the HHs
		Fair=26-50 % of the HHs
		Good= >50% of the HHs
Motivational works towards forestry	Welfare funds/allowance through forestry funds	Poor =No funds for welfare allowance
		Fair = >5% of the annual income
		Good = up to 5% of the annual income
	Financial support through forestry funds to forest dependent people for IGA	Poor = up to 25% of forest dependent households
		Fair = 26-50% of forest dependent households
		Good = >50% of forest dependent households
	Subsidy received through forestry funds for alternative energy	Poor = up to 25% of the HHs
		Fair=26-50 % of the HHs
		Good= >50% of the HHs
	Scholarship through forestry funds	Poor = no forestry funds for scholarship
		Fair= up to 5% of the annual income
		Good= >5% of the annual income
Employment through forestry	Local people hired as labors or staffs	Poor =up to 25 %of required employees/labors
		Fair =25-50% of required employees/labors
		Good = > 50% of required employees/labors
	Received skill oriented training	Poor =up to 10 % of the users 'households
		Fair =11-20% of the users 'households
		Good = > 20% of the users 'households
	Households involved in IGA through forestry funds	Poor =up to 10 % of the users 'households
		Fair =11-20% of the users 'households
		Good = > 20% of the users 'households
Generating common	Amount of income generated	Poor =up to NRs. 25000 per year

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funds through forestry	through forest products	Fair = NRs. 25001-50000 per year
		Good = > NRs. 50000 per year
	Amount of income generated through other sources	Poor = up to 20 % of the yearly income
		Fair = 21-40% of the yearly income
	Good = > 40% of the yearly income	
Mobilization of forestry funds	Investment through forestry funds	Poor = Investment in RI only
		Fair = Investment in RI and FI
		Good = Investment in RI,FI and PPP

Note: Poor= 1, fair=2, and Good=3; RI meaning rural infrastructures; FI meaning forest improvements; PPP meaning pro-poor programmes

Criterion 3. Forest Management Practices (focus to social aspects)		
Indicators	Verifiers	Scoring
Silvicultural operations (ban godne)	Silvicultural operations (ban godne) conducted regularly	Poor = no regular Silvicultural operations
		Fair = Silvicultural operations in a regular basis
		Good = Silvicultural operations in a regular basis and also prescribed it in forest operational plan
	Promoting valuable tree species	Poor = not favored the valuable tree species
		Fair = favored valuable tree species
		Good = favored valuable tree species & also prescribed it in forest operational plan
Plantation activity	Conducted Plantation activity	Poor = no Plantation activity
		Fair = Conducted Plantation activity regularly
		Good = Conducted Plantation activity regularly & also prescribed it in forest operational plan
Incidence of forest fires	Occurrence of forest fires in forest areas	Poor = artificial and deliberate forest fires
		Fair = artificial and accidental forest fires
		Good = more natural and controlled forest fires only
	Fire lines in forest	Poor = no fire lines in the forest
		Fair = existence of fire lines in the forest
		Good = existence of fire lines in the forest & also prescribed it in forest operational plan
Block divisions	Block divisions in the forest	Poor = no block divisions in the forest
		Fair = divisions of forest into blocks
		Good = block divisions in the forest & also prescribed it in forest operational plan
Wet land in forest	Prevalence of wet land in the forest	Poor = no wet land in the forest
		Fair = Prevalence of wet land in the forest
		Good = Prevalence of wet land in the forest and maintained it regularly
	Pond created artificially	Poor = no pond created artificially in the forest
		Fair = Pond created artificially in the forest
		Good = Pond created artificially in the forest and maintained it regularly
Grass land in forest	Prevalence of Grass land in forest	Poor = no grass land in forest
		Fair = Prevalence of grass land in the forest
		Good = Prevalence of grass land in the forest with clear

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		guidelines
	Grass land created artificially	Poor = no grass land created artificially in forest
		Fair = grass land created artificially in forest
		Good = grass land created artificially in forest with clear guidelines
Recreation area in forest	Forest area allocated or created for recreation	Poor = no forest area allocated for recreation
		Fair = forest area allocated for recreation
		Good = forest area allocated for recreation and developed facility as well in the area

Note: Poor= 1, fair=2, and Good=3

Criterion 4 : Institutional framework and governance			
Indicators	Verifiers	Scoring	
Policy	Existence of policy	Poor = no national policy for CBFM	
		Fair=existence of national policy in CBFM	
		Good= existence of national policy and put it into practices	
	Rules exist for collection	Poor =no rules for forest products collection	
		Fair= rules exist for forest products collection	
		Good= exist forest products collection rules and put it into practices	
Leadership	Punctuality	Poor =less punctual in pre-determined programmes	
		Fair= some punctual in pre-determined programmes	
		Good= highly punctual in pre-determined programmes	
	Democratic mindset	Poor =less democratic and credible	
		Fair=some in democratic style and credible	
		Good= highly democratic and credible	
	Performed activities	Poor = Performed activities without approved plan	
		Fair= Performed activities with approved plan	
		Good= Performed activities with consensus and approved plan	
	Knowledge on forest policy	Poor =no Knowledge on forest policy	
		Fair=little Knowledge on forest policy	
		Good=good Knowledge on forest policy	
	Sensitive on OP and constitution	Poor =not Sensitive towards OP and constitution	
		Fair=little Sensitive towards OP and constitution	
		Good=very Sensitive towards OP and constitution	
	Healthy	Poor =not healthy to walk around the forest	
		Fair= healthy to walk around the forest	
		Good= healthy and ready to walk around the forest as needed	
	Nature of EC	Inclusive (gender and marginalized people)	Poor = not inclusive
			Fair= representative in terms of gender and marginalized people
			Good= representation from marginalized people & also balanced equally from gender perspective
	Transparency	Citizen charter	Poor = no citizen charter
			Fair= Citizen charter with poor visibility
			Good= Citizen charter with high visibility
Public notice		Poor =no public notice circulated	
		Fair= public notice circulated in limited place	

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		Good= public notice circulated widely	
	Public hearing	Poor =no public hearing held	
		Fair= public hearing held regularly	
		Good= public hearing held regularly and timely	
	Performed activities	Poor= activities performed without approved plan	
		Fair= activities performed with approved plan	
		Good= performed activities with prior notice and approved plan	
	Sub-committee	Poor =no sub-committee for financial activity	
		Fair= sub-committee exists for financial activity	
		Good= sub-committee exists for financial activity and prescribed it in OP and Constitution	
	Office management	Office building	Poor =no office building
			Fair=own office building exists
Good=own office building with communication facility			
Office outlook		Poor = office not good looking	
		Fair= office good looking	
		Good= good looking office with meeting hall	
Office assistant		Poor =no office assistant	
		Fair= office assistant in the office	
		Good=office assistant with good responsibility bearing	
Meeting held		Poor =no regular meeting of the executive committee	
		Fair= regular meeting of the executive committee	
		Good= regular meeting of the executive committee with full members	

Note: poor=1, fair=2, and good=3

Source: Pokharel et al, 2013

Appendix-III: Questionnaire Survey

1. Respondent Information:

Name: _____ Sex: _____ Age: _____
 VDC/Village: _____ Education: _____ Caste/Ethnicity: _____
 Occupation: _____ Land holdings: _____ Family Size: _____

(No.)

Annual Income/Well being Category: /Rich () Medium () Poor ()

Ever been Executive Committee Member: Yes () No ()

2. Do you have any idea about the CFM activities? (Yes (); No ())

3. Do you have the knowledge about operational plan of CFM? (Yes (); No ())

4. Demand of Forest Product (Household per year)

Items	Timber (Cubic Feet.)	Firewood (Quintal)
Demands/Year		

5. Distance to the forest from their Village () More than 5km () Less than 5km

6. Which types of benefits are you or your family receiving from your CFM?

- Forest Products (Timber, Fuel wood, Fodder, Grass)
- Employment/wages
- Trainings/workshops/study tours
- Others (indirect Jobs: tractor owner, Labor agent etc)

7. CFM-G mobilizes some funds for carrying out different types of activities. How do you think about the process? () Poor; () Fair; () Good

8. Is CFM has any contribution in your income generation activates? Yes (); No ().
IF yes what?

9. What kind of sources of income for people, are available in your forest? (Like: Wages for timber collection, Fishery, NTFP, home industries if any?)

10. Are you agreeing with the existing system of decision making/benefit sharing mechanism?

(a) Yes= completely agree with existing system; (b) Yes! But= Agree but still need to be improved; (c) No! But= Do not agree but no idea about alternatives and (d) No= completely against the existing system.

11. In the context of Tilaurakot CFM, how do you rank the following statements?

Rank: **5 = strongly agree**; 4 = agree, **3 = moderately agree**; 2 = disagree; **1= strongly disagree**

- a. Forest products extracted from CFM have reached to distant users (....)
- b. Illegal extraction and felling has been fully controlled (....)
- c. Forest fire has been fully controlled (....)

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- d. Effective protection from forest encroachment (....)
- e. Local employment is generated (....)
- f. Forest management has increased regeneration (....)
- g. Forest Management Plan implemented with the coordination and cooperation of all stakeholders (DFO, DDC, VDCs, and Users) (....)
- h. Common understanding and commitment has developed among the stakeholders (....)
- i. CFM programme is running in a right way and satisfactorily (....)
- j. Income generating activities of CFMG members has increased through CFM activities (....)
- k. Forest condition and health is improving (....)
- l. Tilaurakot CFM has developed the scientific forest management plan and is recently been implemented this will address most of the problem and create opportunities as mentioned (....)

12. Give your opinion in change area after the implementation of scientific forest management programme in the following areas? Please tick (√) in the appropriate option.

SN	Changed area	Increased	As before	Decreased	Don'tKnow
1	Environmental opportunities/Contribution				
a	Maintenance of greenery				
b	Regeneration				
c	Plant biodiversity				
d	Wild life and Birds				
e	Conservation of wet land				
f	Illegal feeling control				
g	Encroachment control				
h	Control in forest fire				
i	Development of agro-forestry				
j	Development of private forest				
2	Social Opportunities/Contribution				
a	Job creation and livelihood support				
b	Fulfillment of Forest product demand				
c	Social infrastructure development				
d	Awareness of people				
e	Human resource, Skill development				
f	Leadership Development in society				
g	Coordination and Network in local level				
h	Positive attitude of stakeholder toward CFM				

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	(feeling of ownership)				
i	Office Management Capacity of group				
j	Conservation of socially important place				
3	Economic opportunities/Contribution				
a	Income of people				
b	Forest based Job/Green Job				
c	Forest base small industries				
d	Livestock farming				
e	Agro forestry support				
f	Support for Private forest (seedlings or)				
g	Fund mobilization for people				
h	Revenue collection from forest				
i	Opportunity in Carbon Business				
j	Other..... if any				

Appendix-IV: Checklist for Key Informant Survey and Focus Group Discussion

Forest Management Plan

- What types of forest management activities has been started in Tilaurakot CFM?
- Do the existing forest management practice is appreciated by local people?
- What the change in Forest Management Practice in comparison to previous one?

Plan implementation

- What are the major activities conducted inside forest after the initiation of Scientific Forest Management practice?
- What are the major activities conducted for social and local development after the initiation of Scientific Forest Management and where they are conducted (location)?
- Do other activities also conducted after the initiation of Scientific Forest Management?
If yes what are they?
- What are the major sources of income for TCFM?
- How frequently the CFMC meeting conducted?
- How is it implemented?
- Whose role is important for implementation of Scientific Forest Management?
- What is the condition of forest protection after the initiation of Scientific Forest Management? Regarding Forest protection, grazing control, forest fire control, wildlife conservation and control poaching, encroachment control, illegal felling of trees, plantation site, valuable tree species protection, wet land site conservation, etc.
- Any other.....

Opportunities of Forest Management

- What is the difference between traditional management and scientific forest management adopted in TCFM?
- What are the environmental opportunities now?
- What are the economic opportunities now?
- What are the social opportunities now?
- What types of users are more benefited from scientific forest management? What are the means of benefit for them?
- What are the challenges or threats for existing practice?
- Which occupational / ethnic users are more depend on forest and give more attention regarding scientific forest management?
- Common Perception of focus group regarding the scientific forest management.

Others, if any

APPENDICIES

Appendix-V: Cost Benefit Analysis

Benefit cost analysis of TCFM on the basis of its inventory report and management plan

SN	Item	Quantity	Rate (000)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
1	Income													
1.1	Sale of timber (cft)													
	Sal (Species)	1797104	0.45	23785	47570	71356	95141	95141	95141	95141	95141	95141	95140.8	808697.6
	Other (Species)	2248896	0.225	14882	29765	44647	59530	59530	59530	59530	59530	59530	59529.6	506003.2
1.2	Firewood sale (chatta)	9044	10	2660	5320	7980	90440	90440	90440	90440	90440	90440	90440	649040
	Total			41327	82655	123983	245111	245111	245111	245110	245111	245111	245110.4	1963740.8
	Present value of income at discount rate 13%	938516.19		36573	64731	85926	150331	133036	117731	104187	92201	81594	72206.7	
2	Expenditure													
2.1	Fireline cum access road construction around compartments (28 compartments *6 km) including around working sub-compartments	168	10	360	360	320	320	320						1680
2.2	Timber collection (1st year 119000 cft, 2nd year 238000 cft, 3rd year 357000 cft, 4th year onwards 476000 cft)	4048400	0.05	5950	11900	17850	23800	23800	23800	23800	23800	23800	23800	202300
2.3	Firewood collection (chatta) 266, 532, 798 and 4th year onwards 1064 chatta	9044	6	1596	3192	4788	6384	6384	6384	6384	6384	6384	6384	54264
2.4	Silviculture and cultural operation (ha)	4675	5	2338	2338	2337.5	2337.5	2337.5	2337.5	2337.5	2337.5	2337.5	2337.5	23376
2.5	Regeneration promotion 2 times in 10 yrs period	1162	5	1162	1162	1162	1162	1162	1162	1162	1162	1162	1162	11620
2.6	Watcher @ 1 per compartment	28	60	720	1020	1320	1620	1620	1620	1620	1620	1620	1620	14400
2.7	Fireline maintenance (72 km)	72	3		216	216	216	216	216	216	216	216	216	1944

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2.8	Training awareness programme	1	200	200	200	200	200	200	200	200	200	200	200	2000
2.9	Measurement, sub-compartment delineation and supervision cost	1	250	250	250	250	250	250	250	250	250	250	250	2500
2.1	Nursery and seedling production	70000	0.005	350	350	350	350	350	350	350	350	350	350	3500
2.1	Public land plantation Inc three row bamboo plantation along Kundra khola (ha)	350	6	210	210	210	210	210	210	210	210	210	210	2100
2.1	Private forestry promotion/IGA support	10	500	500	500	500	500	500	500	500	500	500	500	5000
2.1	Timber/firewood sales depot (No)	10	50	100	100	100	100	100						500
2.1	Management cost													0
2.14.1	Vehicle purchase			200	1400									1600
2.14.2	CFM secretariat and Ilaka forest Office construction	2	1500		1500	1500								3000
2.14.3	Computer and other equipments	1	200		200	200	200							600
2.14.4	Fuel, stationary and other expenditures	1	800	800	800	800	800	800	800	800	800	800	800	8000
12.14.5	Office assistant	1	130	130	130	130	130	130	130	130	130	130	130	1300
	Total			14866	25828	32233.5	38579.5	38379.5	37959.5	37960	37960	37959.5	37959.5	339684
	Present value of expenditures at discount rate 13%		172679	13155	20227	22339	23662	20831	18233	16135	14279	12636	11182.4	
	Net cash flow (P-N)			26462	56828	91749	206531	206731	207151	207151	207151	207151	207151	1624055.4
	NPV		765837.2											
	B/C ratio		5.44											

**Appendix-VI: Sustainability assessment of Tilaurakot Collaborative Forest
(TCFM)**

S.N.	Criteria	Indicators	Scores of the Verifiers
1	Extent of forest resources (focus on environmental condition)	Forest condition	16
		Forest growth and harvest	2
		Greenery	5
		Coverage in forest ground	2
		Changed forest area over time	2
		Wildlife in forest	5
		Sum of Scores of Verifiers	32
2	Economic and social benefits	Awareness of people towards the importance of forestry	6
		Participation of people in forestry works	4
		Access to benefits	2
		Distribution of benefits	3
		Motivational works towards forestry	4
		Employment through forestry	6
		Generating common funds through forestry	4
		Mobilization of forestry funds	2
		Sum of Scores of Verifiers	31
3	Forest management Practices focus to social aspect	Silvicultural operations	6
		Plantation activity	2
		Incidence of forest fires	5
		Block division	3
		Wet land in forest	3
		Grass land in forest	3
		Recreation area in forest	1
		Sum of Scores of Verifiers	23
4	Institutional frame work and governance	Policy	6
		Leadership	13
		Nature of Elected Committee	2
		Transparency	10
		Office management	8
		Sum of Scores of Verifiers	39

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S N	Criteria	No. of Verifiers	Sum of Scores of verifiers	Average Scores of Verifiers (=b/c)	¹ Weightage to each indicator	SIIC=(c*e)/b	OSI= Sum of (f)/4
	a	b	c	d	e	f	g
1	Extent of forest resources	13	32	2.46	0.15	0.37	0.53
2	Economic and social benefits	18	31	1.72	0.20	0.34	
3	Forest management Practices	11	23	2.09	0.25	0.52	
4	Institutional frame work and governance	18	39	2.17	0.40	0.87	
	Sum	60			1	2.10	

Note: SIIC= Sustainability Index of Individual Criteria; OSI=Overall Sustainability index

¹Weightage was assigned as Pokharel et al 2014 has adopted in their study. That was also agreed during the focus group discussion.

Model used as prescribed by Singh (2000) as below:

$$SIIC = \frac{\text{Sum of weighted scores of verifiers}}{\text{Number of verifiers of indicators in the respective criteria}}$$

$$OSI = \frac{\text{Sum of SIIC}}{\text{Number of criteria}}$$

Therefore, Overall Sustainability Index (OSI) = 0.53, this can be interpreted as the TCFM is heading toward sustainability (i.e. OSI>.50). However, as we know the more the OSI the more the sustainability. Therefore, it can be concluded that TCFM is at the initial stage toward the sustainability. It needs stability and the continuity to enhance and maintain the area of each criterion and indicator.

Appendix-VII: Some Photo Plates



Interviewing the Local People



Interview of President of TCFM



Taking key information from District Forest Officer and Staffs in DFO Premises



Loading of timber by local labors



Regeneration Felling area

PROFILE- 2017

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Bhoj Raj Pathak, male, born in October 07, 1982 in Kailali, Nepal, Forest Officer (Gazetted III) in Department of Forest, Kathmandu, Nepal, has completed Bachelor in Forestry in 2012 from Tribhuvan University, Nepal, also had completed Intermediate Science (I. Sc.) in Forestry in 1999-2001 and has begun working as an employee of Civil Service Nepal (Forest Service) since 2003, has served the national by working in various level of offices such as District forest office, Regional Training Centre, Central office of Department of Forest, Bilateral mission project for Forest Resource assessment, has visited more than 50 districts (out of 75) during various field works, has participated various national and international training and workshops related to forestry inventory, sustainable forest management, good governance, biodiversity conservation, climate change, environmental impact assessment etc. The author has published one dissertation in 2012 and one academic article in international journal in 2017.

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谢屹，男，教授，博士生导师，1977年出生于江西广昌。1995年至1999年间，于北京林业大学林业经济管理学院学习，获得学士学位。毕业后，先后就职于北京市光华木材厂等单位。2003年至2008年，于北京林业大学攻读并获取林业经济管理学专业博士学位。2008年7月，留校工作于经济管理学院林经系，主讲本科及研究生《林业经济学》、《自然资源与环境经济学》等课程。2011年4月至2012年3月，受国家留学基金会资助，赴瑞典农业大学林经系访学一年。至今，主持（参与）在研和完成国家自然科学基金、国家社科基金、北京社科基金等资助科研课题逾30项，在《Journal of Forest Economics》、《Forest Policy and Economics》、《林业科学》等期刊发表学术论文80余篇，出版专著1部，参编（译）书籍5部。曾获北京市哲学社会科学基金二等奖、中国林业经济学会学术论文一等奖等奖励20余项。指导硕士生毕业逾10名。

Xie Yi, male, professor, doctoral tutor, born in 1977 in Jiangxi, China. From 1995 to 1999, he obtained a bachelor's degree from the School of Forestry Economics and Management, Beijing Forestry University. After graduation, he successively worked in Beijing Guanghua Wood Factory and other units. From 2003 to 2008, he studied and obtained a Ph.D degree in forestry economics from Beijing Forestry University. In July 2008, he starts working in School of Economics and Management of Beijing Forestry University, he offers courses on "forest economics", "natural resources and environmental economics" and others related areas to the undergraduate and graduate students. Moreover, he has visited University of Sweden from April 2011 to March 2012; it was funded by the National Study Foundation. To date, he hosts and participates in more than 30 research projects in the field of Collective forest tenure reform, wildlife conservation economics and policy and individual farmers' forest management behaviors. He has published 1 monograph and more than 80 academic papers in "Journal of Forest Economics", "Forest policy and economics", "Forestry science" and other periodicals Journals. He has won the second prize of the Beijing Municipal philosophy and Social Science Fund, the Chinese Forestry Economics Society Academic thesis First prize award in more than 20 items. Currently he is supervising more than 10 graduate students.

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