

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Climate change is one of the major issues that has been under the debatable table since the start of industrialization. The industrialization thus started in 19th century became the seedling for starting the climate change. In recent years, global climate change been recognized as a significant driver of ecological change (IPCC 2007). The impact of climate change has been seen in the atmosphere all around world with no exception to Nepal. The temperature of world is increasing day by day to the point of global warming. The IPCC projects that the average annual temperature in South Asia will increase by 3-4°C by 2080-2099 under an A1B (medium-high emissions) scenario, and likely higher under an A2A scenario based on comparisons with historical averages from 1980-1999, while annual precipitation is expected to increase throughout this region (Meehl *et al.* 2007a). The future trend shows the average increase in temperature to reach 2 to 3 degrees Celsius as compared to 1980-1999 and 2080-2099 (Christensen *et al.*, 2009).

In the present days, climate change is considered as one of the major threats to maintain food security. The concept of climate smart Agriculture has been brought in the sense to limit the impact of climate change on agricultural sector. This concept not only tries to stop the direct impact but also tries to create an adaptative solution to the changing environment and climate. The sole idea of climate smart agriculture is based on a major approach that states the reduction in the effect of climate change to agriculture along with the reduction in the causes of changing environment. The climate-smart agriculture (CSA) concept is gaining considerable traction at international and national levels to meet the challenges of addressing agricultural planning under climate change. CSA is a concept that calls for integration of the need for adaptation and the possibility of mitigation in agricultural growth strategies to support food security (Asfaw and Branca, 2018).

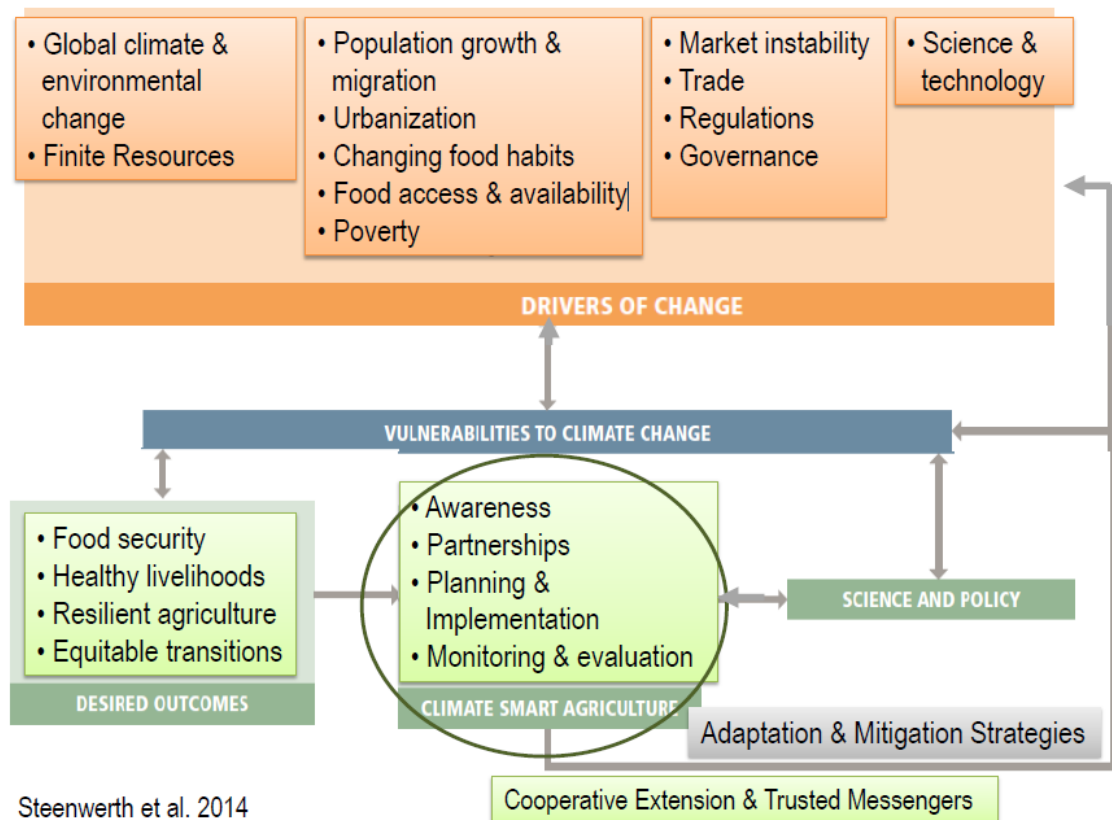
As per the predictions of FAO, the estimated increase in the demand of food in 2050 will be 60% higher than that of 2006 which is supposed to be fulfilled by only about 20% expansion in arable land. The future prediction is already in high point which is very difficult to gain. The degrading climatic condition has led to increment in the challenges to fulfill the required amount of food required in future world. So, CSA

approach is being used for maintaining the required production. In this frame, Climate Smart Agriculture (CSA) is an approach that calls for integration of the need for adaptation and the possibility of mitigation in agricultural growth strategies to support food security. (Asfaw and Branca, 2018).

CSA integrates the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges. It is composed of three main pillars:

1. sustainably increasing agricultural productivity and incomes;
2. adapting and building resilience to climate change;
3. reducing and/or removing greenhouse gases emissions, where possible.

Figure 1: Brief description on climate smart agriculture



The above figure explains briefly about CSA approach. The figure can be understood as the Global climate and environmental change, finite resources, population growth and migration, urbanization, changing food habits, food access and availability, poverty, market instability, trade, regulations, governance and science and technology as the main drivers of change that leads to climate change. The climate change affects food security, healthy livelihoods, resilient agriculture and equitable transitions. Thus,

to tackle against these all, the approach of CSA is brought into practice which creates awareness, partnership, planning and implementation and monitoring and evaluation as adaptation and mitigation strategies to climatic change.

Leasehold forestry; an approach to Climate Smart Agriculture; is a method to conserve the forest along with the development of people. This is a new concept than community forestry where a group of disadvantaged peoples are given the authority over the forest area that has been depleted due to human activities. The marginalized people or the disadvantaged people with the authority to handle the forest use the forest byproducts for their own development as well as they control the unwanted use of the forest. 'Leasehold forestry, is to support disadvantaged people through creating livelihood opportunities by forestry and livestock interaction. For this, the degraded forest is leased to a group of disadvantaged households for their exclusive use. The leasehold members get an endowment for access rights with a 40-year lease deed contract with District Forest Office' (Koirala, 2010). Major aims of Leasehold forestry are:

1. Environmental rejuvenation
2. Poverty alleviation support
3. Social empowerment

1.2 Statement of the problem

The present world is facing the problem of climate change. Climate change has taken its toll on all the nooks and corners of the world. One of the major threats of climate change is considered food security. The world food production has started to lack as compared to the increasing population. The same situation has been seen in Nepal as well. Global warming and climate change are the great concern of today since they affect not only the living beings but also the whole ecosystem of this world. However, its impact on agriculture can be understood directly as agro sector is more dependent on natural nurture. This concern is equally applicable to Nepal too as early symptoms of climate cruelty and alarmingly increased temperature have been observed almost in double pace within shorter time horizon compared to global temperature rise (Acharya & Bhatta, 2013).

As a solution to the changing climate and its impact on agriculture as well as livelihood, CSA practice has to be adapted. CSA approach is highly prescribed as

reducing the emissions associated with conventional agricultural growth models is one of the largest and most cost-effective means of reducing GHG emissions, and thus the CSA approach integrates the potential for obtaining mitigation co-benefits from agricultural growth strategies (Zilberman, Lipper, McCarthy, Asfaw, & Branca, 2018). The CSA approach helps to strike at the most crucial part of ecosystem i.e. forest ecosystem. The system of using new methods to produce the crops along with the reduction of pollution and also controlling pollution can be a striking agent to change the present pollution as Climate-smart agriculture (CSA) may be defined as an approach for transforming and reorienting agricultural development under the new realities of climate change (Lipper et al. 2014).

The concept of leasehold forestry; on the other hand; being one of the measures of CSA approach helps in controlling the climate change by striking at the most crucial part of the ecosystem i.e. forest ecosystem. In leasehold forestry, the main idea of handling the controlling key to the back-warded and marginalized people of surrounding area will surely help them to uplift their status as well as uplift the status of the forest. This is against the idea of CPRMS (Common pool resource management system) where common resource area will be degraded as no one feels responsible about it. But when the resource is given to one's right then he/she will try their best in its preservation as man is rational and only work in the places of profit.

Community forestry was one of the approaches that helped in protection of forest area to a greater extent but the problem in equity as a result of community forestry has given a rising platform for leasehold forestry. 'Nepal's community forestry program has had a significant positive environmental impact and communities have used the income generated to build public facilities ranging from schools to suspension bridges. However, equity remains problematic: many community forestry user groups are dominated by the local elite, while socially- and economically disadvantaged people's participation is often lacking, and poor households tend to benefit less than the relatively better off' (Baral 1999, Malla 2000, Ojha and Bhattarai 2001, Shrestha 1996, Varughese 1999, Winrock International 1998, World Bank 1999).

1.3 Objectives

The sole purpose of the study is to analyze the change that has been triggered by the use of one of the Climate Smart Agriculture techniques i.e. Leasehold forestry, in the

marginalized people of Korak (Katilekhola) of Chitwan district as well as to check the applicability of other CSA techniques in Nepal. The objectives that match the context of this study are:

1. To assess the socio-economic status of Climate Smart Agriculture practitioners in marginalized people of study area.
2. To evaluate the effectiveness of Climate Smart Agriculture practice (leasehold forestry) in the study area.
3. To analyze the different practices under Climate Smart Agriculture practices in context of study area.

1.4 Assumptions

“The use of Leasehold forestry has been effective technique to promote the status of people of the study area”. The use of this techniques has not only helped promote the people’s status; it has also helped them tackle their marginalization and has helped them to establish their identity. The use of leasehold forestry has also supported in the conservation of the forests in the area. The study will also help in determining whether other CSA techniques can be used in context of Nepal or not.

1.5 Significance of the study

This study is a guideline for the policy makers and researchers to investigate on how leasehold forestry has been able to uplift people’s livelihood and has conserved the environment alongside. This will also be able to impart knowledge on the people on other types of CSA techniques can be applied in the context of Nepal. The idea on the change in the livelihood of the people using leasehold forestry will be a guiding stone for many other researchers to create a similar situation in other areas where marginalized people are under threat. This will be able to create a different pathway on simultaneous benefit achievement strategy i.e. both by the people and environment. This will help in determining pathway on breaking the circle of poverty specially among the marginalized population of Nepal. The idea imparted by CSA i.e. different way of agricultural practice (saving and consumption) will be a new way of Natural conservation and maintenance of the carrying capacity of land and can be used as one of the best techniques of controlling land degradation.

1.6 Limitations of the study

The study has been limited to Korak of Chitwan district. The marginalized people of Katlekhola has been studied. General population has not been considered as research sample frame as the objectives are only fulfilled by assessing and studying about the marginalized people only. Other VDCs and municipalities was not of concern to this research.

1.7 Organization of the study

The first chapter is the Introduction where the idea on the Leasehold forestry and Climate Smart Agriculture has briefly been written along with the objectives and the basic idea on the research.

The second chapter is Literature Review where different ideas from different writers and pre-studied ideas are assembled along with the practice of leasehold forestry and climate smart agriculture.

The third chapter is the Research methodology where the ways to complete the research and the ways to extract the data has been elaborated.

The fourth chapter is the data analysis where the data has been put into solution or mathematical calculation (as per the requirement).

The fifth chapter is conclusion where the final verdict on the finding has been written.

1.8 Operational Terminologies

The socio-economic status of marginalized people of Katlekhola is identified which includes health, education, participation, community relation in social sector; land and other economic sources such as house, facilities, etc. in economic sector.

Climate-Smart Agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate by tackling three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible.

The process whereby something or someone is pushed to the edge of a group and accorded lesser importance is called marginalization. This is predominantly a social

phenomenon by which a minority or sub-group is excluded, and their needs or desires ignored. The people who are being the victim of marginalization are considered to be marginalized peoples.

1.9 Justification

Not only in the context of Nepal, climate change has been one of the major burning issues in whole world. The irrational change in temperature has led to the decreased production and reduced productivity. This decreased production has taken its toll in the livelihood of the people along with the diminishment of cultivable area for cultivation. The climate smart agriculture with the approach of increased productivity along with conservation of environment can be a boon for reducing the impact of changing climate along with the increased production. In context of Nepal, the practice of leasehold forestry has been one of the best measures to save the nature along with the upliftment of marginalized peoples. The requirement to save the forest has increased day by day and the challenge has been increasing with more poachers invading the forest area. The system of community forestry had helped much to lessen the poaching and invading of the forest area but the beneficiary was known to be the powerful people displacing the marginalized people. So, to address this issue, the idea of leasehold forestry has to be adapted.

CHAPTER TWO: LITERATURE REVIEW

2.1 Background

The practice of leasing agricultural land to tenants has existed from time immemorial. The leasing of publicly-owned forest lands to private agents for forest-based enterprises along with performance bonds where the private enterprises are required to grow forests is quite common in countries such as Malaysia, Indonesia and the Philippines (Richards, 1999). The practice of leasing government land to individual households for the purpose of forest regeneration and poverty reduction is however relatively new.

India is one country that has experimented with a form of leasehold management regime under the Capacity 21 Project with the support of the United Nations Development Program (Parikh, 1998).

In general, forest management regimes in developing countries aim at livelihood improvements rather than seeing forests as engines of economic growth. Livelihood improvements occur in a number of ways such as increased availability of biomass, reduced drudgery, savings in collection time, supplementary incomes, etc. But in non-monetized economies, these benefits are difficult to measure. Some of the literature on the LHF practice in Nepal have concluded, for instance, that households have been able to save a considerable amount of the time spent in collecting forest products for livelihood as a result of LHF in their communities ((Bhattarai, Dhungana, & Kafley, 2007); IFAD, 2003; (Thompson, 2000).

Similarly, a study of LHF in Nepal by Thompson (2000) has examined its impact using both program and control households. The findings indicated that there was a slight increase in the value of large livestock and a reduction in the scarcity of livestock feed. The limitation of the study was that it did not focus on an economic valuation of the contributions of leasehold forestry but dealt with only livelihood aspects.

The Department of Forests (DoF) is currently implementing the community-based forests management program in 26 districts with the financial and technical support of the United Nations Food and Agriculture Organization (FAO), the International Fund for Agriculture Development and the Government of Finland. The program is under implementation since the last 22 years with the objective of environment protection

to say that leasehold forestry is better than community forestry, but rather that the concept and implementation of community forestry could be enriched by integrating leasehold forestry in a jointly implemented program.

2.2 Historical Review on Climate Smart Agriculture

FAO launched the concept of climate smart agriculture (CSA) in 2009 to draw attention to linkages between achieving food security and combating climate change through agricultural development, and the opportunities for attaining large synergies in doing so. In practice, the CSA approach involves integrating the need for adaptation and the potential for mitigation into the planning and implementation of agricultural policies, planning, and investments (Zilberman, Lipper, McCarthy, Asfaw, & Branca, 2018). The concept of FAO started rapid growth after 2010 and widespread attention and interest also peaked after 2010. CSA got beyond agricultural practices and technologies to include enabling policies and institutions as well as identification of financing mechanisms. (Asfaw and Branca, 2018).

On the other hand, the concept of leasehold was started in Nepal especially by FAO in 2004 but the practice of leasehold practice was persistent in Nepal since some time ago. The concept of leasehold forestry for poverty alleviation came into implementation in 1993, through the Hills Leasehold Forestry and Forage Development Project² (HLFFDP), which had two objectives, to: alleviate poverty and improve the ecological conditions of the hills.

Leasehold forestry is a new kind of participatory forest management modality introduced in 10 districts in 1992 for 10 years as a Hills Leasehold Forestry and Forage Development Project (HLFFDP) by the government of Nepal with financial support from International Fund for Agricultural Development (IFAD), Asian Development Bank and Dutch funded Food Agricultural Organization (FAO). Based on the achievements of HLFFDP, the government of Nepal continued leasehold group formation and supports from its own financial sources as Bridging Phase for three years (2002-2005). In 2005, IFAD again continued support and current Leasehold Forestry and Livestock Program (LFLP) was launched for the period of 8 years in 22 hill districts with dual goals of reducing poverty of 44,300 poor families through

increased forest and livestock production and ensuring environmental amelioration¹(Laudari & Kaini, 2014).

2.3 Theoretical Review on Climate Smart Agriculture

Symbiotic Interactionism

The theory related to leasehold forestry can be understood easily with the help of symbiotic interactionism. Symbiotic interactionism means the process by which one used the resources of other to get the benefit from them and in return they also give something to them. The name symbiosis was coined by Anton de Bary and he defined it literally as the “living together of dissimilarly named organisms” (Martin and Schwab, 2012). So symbiotic interactionism can be understood as the process of interaction between any two species or biotic products that create a symbiotic relationship within them. In the concept of leasehold forestry, the people and forest remain together in a peaceful environment and they constantly aid each other so that no one have to live a harsh life.

Symbiosis is defined as the living together of dissimilar organisms (McDougall, 1918, p. 254). Here people and forest area are in interaction. People extract what they require from the forests and the they preserve the forest as well. They have the key to forest maintenance as well as destruction which makes them a type of owner as well as beneficiaries as they will have to rely on the forest products to uplift their lifestyle. This interactive relation between the forest and the marginalized people helps to stress in the point that the concept of leasehold forestry and symbiotic interactionism can be interrelated to each other.

Theory of equitable distribution

Leasehold forestry has been brought into life as a result of failure of community forestry to manage the equitable distribution among people. The rich and powerful people got more access to the forest resources and they only developed as a result of which inequity was established. Equity theory proposes that individuals who perceive themselves as either under rewarded or overrewarded will experience distress, and that this distress leads to efforts to restore equity (Huseman, Hatfield and Miles, 2013). The distress sometimes leads to destruction i.e. of forest resource.

The theory of equitable distribution states that there must be equality in the distribution of resources where equality must be made as per the requirement. Equity

¹ Amelioration means the act of making something better; improvement.

implies the distribution of resources in a planned way i.e. more to the lease holders and least to the more holders. Here the people with already benefitted lifestyle are given lesser priority in-terms of resource allocation and distribution than to the least benefitted peoples as the requirement of least benefitted people is more just to survive. This idea has given rise to the idea of leasehold forestry.

In condition of absence of equity, there might be conflict i.e. the people of lower level start to protest against upper level in one hand and the people in upper level will start pressurizing the people of lower level. This dispute creates an interaction where the natural resource (forest in terms of leasehold forestry) will be affected more as they will start a battle for more use of the forest resources in one way or the other. The equity sensitivity construct proposed here relates directly to equity theory and suggests that individuals react in consistent but individually different ways to both perceived equity and inequity because they have different preferences for (i.e., are differentially sensitive to) equity (Huseman, Hatfield and Miles, 2013).

2.4 Empirical Review on Climate Smart Agriculture

The practice of Climate Smart Agriculture has been in practice in many countries among which the practice in some Asian countries are:

Aqua-silviculture: An environmentally friendly Mari-culture system in Viet Nam

The model was introduced as an environmentally friendly mariculture system to adapt to climate change. Each farm of about 4 ha was comprised of three components: mangrove forest area, water area for aquaculture, and remaining land for other trees and crops. The waters were stocked with black tiger shrimp and mud crablets. No feed, chemicals or antibiotics were used. The shrimps were harvested after about four months. These farms have received organic shrimp certificates based on the Natural and standard, and they will receive a premium of 10 percent higher than regular prices in the area. Besides aquaculture, management of the mangrove forest is one of the main targets of this system. The farmers look after the trees and have signed a contract with the Forestry Management Board for a 95 percent share of the harvested mangrove trees. The farmers have also diversified their income source by raising freshwater fish, chickens, ducks and fruit trees. However, prawn cultivation is still their main income, around US\$2 400 per ha per year. This arrangement is a low-carbon agriculture system, with mangroves able to absorb approximately 136 tons/ha of CO₂, valued at US\$154/ha/yr. Besides, livelihoods and food security are stabilized

and improved based on diversified income from aquatic animals, fruit trees, terrestrial animals, and mangrove forest trees (Tuan, 2015).

Seaweed farming: A community-based adaptation to climate change in the Philippines

Demand for seaweed is growing rapidly. It is used in meat and dairy products, pharmaceuticals, and beauty products. The case study was from Barangay Salog, the Philippines. Floats are spaced at 0.5 m intervals and seedlings are tied to the lines. They are allowed to grow for 45 to 60 days. Following harvesting, the seaweeds are dried in the sun and stored in rice sacks, and small holders sell it to middlemen. Seaweed farming is to augment the livelihoods of fishers – a typical farmer is able to earn about US\$800 per year from three crops. The claim is that seaweed farming has brought additional income for 40 percent of the 426 households in Barangay Tulang. Moreover, quite a lot of the work involves women. The unexpected benefits include an increase in number and diversity of fish that shelter under the seaweed. The farms are able to absorb carbon dioxide from the atmosphere – a kilo can absorb 185 mg of CO₂. Several other qualities are attributed to seaweeds: they can be grown without land preparation, do not need fertilizers, are resilient to drought and heavy rain, and are nutritious, supplementing the farmers' regular diets. Seaweed farming is a low-carbon activity that brings many benefits to the community and the environment, and is resilient to climate change (Piscano, 2015).

The New Theory of Agriculture: A Thai farmer's climate-smart pathway

Under the system, farmers set aside their land for pond and fish culture, rice cultivation, fruit and tree crops, and the remaining for housing, livestock and other activities. This case study reviewed the Thai farm owned by Mr. Patphong Mongkolkachanahun in Kanchanaburi Province. Initially, Mr. Patphong focused on monocrops such as chili or sweet corn, but due to high production costs and poor soils, his farm failed. He then switched to integrated farming. He divided his 6.24 ha farm systematically for raising various crops that includes rice, fruit trees, livestock and fish. Following a clear farm management plan, waste from the crops is fed to fish and to raise livestock. In order to improve soils, green cover, compost, animal manure and bioliquid fertilizers are used. Natural systems replaced pesticides for weed control. A sprinkler irrigation system was installed, enabling the pond to supply water for the farm year-round. Manure from livestock is used to operate a small biogas unit

which meets household energy needs. The farm's income is mainly derived from the sale of organic fruits to both local and international markets. The other crops, livestock and fish meet the needs of the family and the rest sold in the local markets. According to Mr. Patphong, his farm income has steadily increased, with a total net income of about US\$26 000 in 2014. The farming under the New Theory of Agriculture approach achieves self-sufficiency with improved incomes.

Diversification of crops and introduction of the pond ensures the farm is resilient to changes in the weather patterns. Introduction of tree crops, usage of green manure, and biogas go towards reducing GHG emissions, and promote environmental sustainability. These farm practices clearly adhere to the three objectives of CSA(Khim, 2015).

Floating gardens of Bangladesh: Spreading the tradition

With its deltaic topography and low elevation, the coastal areas of Bangladesh are already facing severe flooding as a result of climate change. It is no longer possible to cultivate these submerged areas. Farmers have adapted to this situation by turning to floating gardens, locally known as dhap, for raising vegetables. The floating plots are made from mats of aquatic weeds (mainly water hyacinth) and bamboo in layers. The top layer is made of cow dung, rice husk and compost for raising vegetables. The floating plot can rise and fall with the water level, and once anchored to the floor with a stake, it remains in position. The size and shape of the bed is not fixed, but is generally around 1.5 to 3 m wide, 0.6 to 0.9 m thick, and 15 to 60 m long. Around 30 species of vegetables, spices and other crops or seedlings are grown in the water-based production system. Family members, especially women are involved in many of the operations, such as raising of seedlings, nursing the bed, and harvesting and processing the produce. On average, farmers are able to earn US\$170 to 230 per season for an estimated 100m² size of the floating plot. The beds are constructed from local, biodegradable, and low-cost material. The farming, with very low usage of agro-chemicals for plant nutrition and pest control, is environmentally friendly with minimal GHG emissions. The floating gardens now allow farming in flooded plains, even if they remain waterlogged after the floods. Even though it was developed out of necessity, the poor with local knowledge and skills have shown the capacity to adapt to climate change. The floating gardens can be classified as CSA practice (Kabir, 2015).

Leasehold forestry in Nepal: A new lease of life for rural communities and forests

Landlocked Nepal remains a poor country, with over 80 percent of its people living in rural areas. These rural communities, with very small landholdings, are heavily dependent on forests to supplement their daily needs. With extensive conversions and over-harvesting, forest resources declined, threatening the food security of the forest-dependent communities. To address this situation, Nepal initiated Community Forestry schemes in 1978. These common-property schemes left out the resource-poor households and socially marginalized people. Recognizing this flaw, the Leasehold Forestry (LF) was developed. Impoverished households received about 1 ha of degraded state forest land for a lease of 40 years. They are required to protect the forest lands against degradation so natural regeneration of trees and other plants can continue. The households were also allowed to cultivate economically valuable trees (NTFPs) and fodder and received livestock (mainly goats) that were stall fed. Technical advice, training, and other income-generating skills were provided. Surveys six to seven years following implementation showed positive developments. The programme contributed to reduction in poverty, improved nutrition, and women spent less time on fodder and fuelwood collection and pursued other more profitable activities. The environmental benefits were equally impressive. Green cover of the leasehold forest plots surveyed had improved significantly, and natural regeneration of trees accelerated. Assessments also pointed towards improvements in environmental services and biodiversity. The LF programme appears to have clearly achieved poverty alleviation, diversification of income sources and food security. This was achieved simultaneously with improvement of the environment and expansion of forest cover in the hilly areas, contributing to climate change mitigation. The link between LF and CSA has been clearly established (Appanah and Shono, 2015).

Vertical farming: An innovative agriculture system for producing food in urban areas

Land scarce Singapore is looking into urban farming to partially reduce their dependence on food imports. This case study examined the innovative vertical farming system initiated by a local firm called Sky Greens. Vertical farming is the practice of cultivating plant life within a skyscraper greenhouse. In this case study, vegetables are grown in 9 m tall A-shaped aluminum towers. Each tower consists of troughs which are rotated around the tower to ensure uniform distribution of sunlight,

irrigation, nutrients and air flow. The farm covers 3.65 ha with 1 800 towers in operation. It raises four types of green vegetables on a five-week cycle and can produce from 4 to 9 tons per day. Operational costs include raw material such as soil, seed and electricity. The vertical farming, compared with traditional farming, has several advantages: less land area, less water (which is recycled), low energy, half the labor, and consumes 75 percent less raw materials such as nutrients. The vertical farm produces 4 percent of locally grown vegetables and adds to the food security needs of the country. The patented vertical farming system can be considered “climate-smart” solution for sustainable food production in land scarce urban areas. Overall, the system achieves a low carbon footprint, this being further boosted through its shorter “food miles” – the distance to take produce to market is very short compared to imported produce. But the potential of vertical farming may go beyond urban areas – the reduced use of raw materials such as water and soil make it viable for sites where the natural resources have become severely degraded. Currently, the start-up costs are high, but with further innovation and economy of scale, these farms may be part of a solution to feed the world faced with deterioration of natural resources and the harmful impacts of climate change (Khim, 2015).

A sample of vertical farming is shown in Annex VII.

2.5 Policy Review on Climate Smart Agriculture

Nepal’s first National Forestry Plan (1976) made the provision of leasing government forest area to individual or community for raising tree and clearly defined tenure rights over these forest resources to caretaker, but the plan was silent on PLF. In Master Plan for the Forestry Sector (MPFS) 1988, the first strategic document of forestry sector, leasehold forestry came under the heading of ‘National and Leasehold Forests’ and considered as a second priority after community and private forest. The Master Plan acknowledged that any part of national forest shall be managed and developed as a leasehold forest through providing forest land in a lease to private sector and industries for producing raw material. However, leasehold forest for poor had not been visualized in MPFS. Forest Act of 1993 has clearly mentioned that forest could be leased to the corporate bodies, industries (forest based or eco-tourism based) and communities but has not envisioned forest for poor people. But, Forest Regulation (1995), strong legal backing document for PLF, has come out with making a special provision of leasing out forests to disadvantaged groups.

The contribution made by leasehold forest for poor has clearly been stated in Agricultural Perspective Plan (1995-2015)-increase agro-based production & livestock development. Similarly, Agriculture Policy (2004) envisaged the provision of handing over marginal land, grazing land and unused public land as a lease land to target groups and acknowledged the role of these lease land in poverty alleviation through production of forage, fodder, agro-forestry, medicinal and aromatic plant, NTFPs and silkworm. Likewise, NTFPs Policy (2004) has encouraged participation of poverty-stricken women to cultivate NTFPs/MAPs inside leasehold forest and community forest to reap the maximum benefit. Recognizing the role of forest for poverty reduction, Eighth Plan (1992-97) targeted 25,000 underprivileged families for benefiting from leasehold forestry program. Ninth Five Year Plan (1997-2001) acknowledged the role of agro-forestry and leasehold forest system in poverty alleviation and committed to continue and strengthen these systems by revising existing forest policy. In addition, Tenth Plan (2002-2007) and its auxiliary, Poverty Reduction Strategy Paper (PRSP) 2002, acknowledged contribution of leasehold forestry to reduce poverty and spotlighted that leasehold forestry concept should also be implemented in community forestry. Moreover, the theme of Tenth Plan was that leasehold forestry should be extended in larger area considering the livelihood opportunities of people living below poverty line. Leasehold Forest Policy (2002), landmark legal document for PLF, has delegated the power regarding PLF process to District Forest Office and alienated mandatory submission of financial feasibility report. The policy has furthermore made the provision of benefit sharing to poor people from the old trees retained during forest handover. However, the policy has yet to be integrated into the Forest Act and Forest Regulations to materialize in the field. Likewise, Interim Plan (2007-2010) of Nepal came with the commitment of improving policies, strategies and implementation procedures in community-based program through wider cooperation and coordination with different stakeholders and local institution to strengthen right, benefits and autonomy of marginal disadvantaged groups. Interim Plan Approach Paper (2010/11-2012/13) has not explicitly spelled out any strategy and working policy to be formulated and implemented to promote PLF but targeted to form certain number of LFUGs of poor and backward classes. In addition to that, it has tried to address the livelihood opportunities of poor, indigenous and ethnic, madhesi and backward people through sustainable forest management and forest-based enterprise development.

2.6 Analytical Framework

Dimensions of enquiry	Variables	Sub-variable	
Social	Health of people		
	People's Education		
	Women's Participation		
	Social Status of People	People's perception towards marginalized people	
		Attitude of people	
		Self-reliance of marginalized people	
		Self- respect of marginalized people	
Economic	People's income		
	People's expenditure		
	Saving		
Effectiveness	Change in livelihood	Physical change	
		Economic change	
		Natural Change	
	Conditions of Leasehold forests		
Viability	Applicability of different practices of Climate Smart Agriculture of Asia in study area	Other climate smart agriculture practice in the study area.	

2.7 Research Gap

Although the concept of community development is very popular, the lack of equity in community development has led to the requirement to add the term equity which is

fulfilled only by Leasehold forestry. Inside leasehold forestry, the marginalized peoples are considered as beneficiaries and their status has to be considered to be uplifted. This finding is to be made. Rather, other findings are more focused on the benefits and prospects of leasehold forestry rather than real life changes in people's life. The finding on the people's socio-economic status is of utmost importance as this is the only topic that increases the reliability to believe the fact whether the leasehold forestry has made any kinds of positive as well as negative impacts on people's lives.

Other than the use of leasehold forestry, the prospects or the applicability of other techniques of CSA in Nepal has not been studied yet. Other techniques; if applicable; will be a boon for agricultural development, people's life upliftment as well as development of nation in a nutshell. The practices of CSA that are practiced in other countries of similar environment; if applicable in Nepal; has to be researched as it has not been studied yet to find out different pathways to sustainable development (includes food security, clean and healthy environment, less depletion of resources and carrying capacity and upliftment of people's standard and increased income leading to economic development of nation as a whole).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Rationale of selection of study area

Katlekhola leased forest, situated in Rapti municipality of Chitwan district, is one among the 107 leasehold forest that has been under management from the marginalized peoples. This forest, after the protection of the marginalized Chepang community has been improved to a great extent. Not only the forest, this idea has helped the people to enlarge their activity frame. This new way of Climate Smart Agriculture i.e. leasehold forestry has helped in strengthening socio-economic status of people i.e. the user group.

3.2 Research Design

Research design is “a blue print for conducting a study with maximum control over factors that may interfere with the validity of the findings”. According to F.N Kerlinger, “Research design is the plan, structure and strategy of the investment conceived so as to obtain answer to research questions and to control variables.” The research techniques are the KII, Interview, FGD, Observation, library, internet. In order to achieve the research objectives, all the available data collection techniques have been used. The qualitative data and quantitative data are also placed in appropriate places.

Descriptive Research Design have been used where descriptive research design means the process of accumulating facts. According to Best and Khan, “A descriptive study describes and interprets what is, it is concerned with conditions or relationships that exists, opinions that are held, processes, that are going on, effects that are evident or trends that are developing.”

3.3 Universe, Sample and Sampling procedure

Among the total of around 2.6 crore population, the total population of Korak is the sampling universe of the study. The Korak area has been considered as sampling frame and the people using the Leasehold forestry has been considered as the sampling population. Among the total of 107 leasehold forestry user groups one sample forest user group is the main sample for the research. The total population of Katlekhola Leasehold forest user group i.e. 60 people is the sample of the research.

(Source: Collected by researcher 2018)

3.3.1 Sampling Procedure

Sampling denotes the process of selection of an area and population of study. First Rapti municipality has been taken into sampling area. The total of 82 leasehold forest groups has been universe of the study. The total population is the entire population of Rapti municipality those are marginalized and has been using leasehold forestry i.e. total of 2905 peoples. Out of the universe, Korak is selected for the sampling frame for research on leasehold forestry. Out of the sampling frame Katlekhola leased forest user group has been selected by purposive sampling technique by the research. The whole population i.e. 60 population is the sample of the research. Among the population of the single patch, all the households were the sample population for the study.

(Source: Collected by researcher 2018)

3.4 Data Collection techniques and tools

For the collection of data, Survey has been conducted along with Key Informant Interview, Focused Group Discussion and General Interview. Questionnaires has been used as the tool for collecting the data in survey.

Interview

- Male sample and female sample respondents have been interviewed i.e. total of 60 population of Katlekhola leasehold forestry user group.

Interview has been done with the help of interview guidelines that has been asked with people as well as the staff members to get the general information on the socio-economic status and the effectiveness of leasehold forestry in Katlekhola. Interview is a data collection technique where any people is presented with set of questions that are asked by researcher himself/herself to get the answer.

A set of questionnaires were presented and the peoples were interviewed in order to find out the answer to the question. All the population i.e. 10 household and 60 people among total household were surveyed to complete the survey. The data thus taken were of qualitative form as well as quantitative form.

Key Informant Interview

Key Informant Interview has been used to abstract specific and specialized information on the topic of Leasehold forestry and other practices of CSA. The

subject of the study are the supervisor of the leasehold forestry of Rapti Municipality and specialized person of the study area i.e. social leader of the area. KII is done in order to get the in-depth information on any topic as any specialists who deals with the problem in their day to day lives are taken as the main subject for data acquisition.

Focused Group Discussion

- 8 peoples of Katlekhola leasehold forestry user group.

A focus group discussion is a unique method of qualitative research which involves a group of people discussing specific set of issues, problems or research questions. A focus group discussion is a formal discussion with 6-10 people on a specific topic. The focus group is facilitated by a facilitator who keeps participants focused on the topic of interest. It is a discussion of 6-10 persons guided by a facilitator during which group members interact freely and spontaneously about a certain issue. The main purpose of a focus group is to explore the range of perspectives around a particular issue and to obtain detailed qualitative data from a predetermined group of people.

In the study area, 8 peoples were gathered and conducted a discussion to check all the information that they presented were true or false. Thus, with the help of focus group discussion the reliability of the study was measured.

Observation

Observation means data collection technique where the data is collected by visualizing and coming to a specific decision on our own. The observation method is widely used for checking the answers thus presented to the researchers by the respondents are valid or not. The visual analysis will be able to differentiate between the answers presented by the respondents and the actual facts that is embedded in the research area.

Observation had been conducted in all the 10 households of Katlekhola leased forestry user group to check their status and also the effectiveness of the leasehold forestry in the study area.

3.5 Data analysis techniques and tools

With the help of grounded theory², the data thus collected has been theorized and respected result will be extracted. The qualitative data is the source of data for getting to a theory in data analysis. Induction method has been used where the particular case of Korak more specifically Katlekhola Leased Forest User group has been generalized to the overall case of leasehold forestry of Nepal. According to P.V Young, “Induction method is the process of reasoning from particular case to whole group of cases, from concrete facts to generalization, from individual’s events to universe.”

² Grounded theory: Grounded theory (GT) is a research method concerned with the generation of theory, which is ‘grounded’ in data that has been systematically collected and analyzed. It is used to uncover such things as social relationships and behaviors of groups, known as social processes.

CHAPTER FOUR: ANALYSIS AND INTERPRETATION OF FIELD SURVEY DATA

This chapter attempts to analyze and collect data and information from the field survey and various sources in response to meet the objectives of the study and to derive the major findings of the study. After the collection of data with the help of different means of data collection, data are presented and analyzed in this chapter by the help of simple statistical tools such as tabulation, percentage, average, bar graph, pie chart, etc. The data consists of population distribution, economic status of people, social status of women consisting of women's participation and the attitudes of people, socio-economic status after the use of leasehold forestry and the usability of another CSA approach in context of study area. For the analysis and interpretation, the chapter has been organized in following way:

4.1 General Information of the Sampling Frame

4.2 Socio-Economic Information of the Study area

4.2.1 Population Distribution

4.2.2 Observation analysis of socio-economic status

4.2.3 Survey Analysis

4.2.4 General Interview analysis

4.3 Effectiveness of Climate Smart Agriculture Practice

4.3.1 Observation Analysis

4.3.2 Survey Analysis

4.3.3 Interview Analysis

4.3.4 KII Analysis

4.4 Different CSA practice in study area

4.4.1 Analysis

4.1 General Information of the sampling frame

Rapti Municipality is a municipality lies in Eastern part of Chitwan district in Narayani zone of Nepal. It was formed as municipality in 2015 by merging three existing village development committees, Birendranagar VDC, Bhandara VDC and

Piple VDC. Total area of this municipality is 99.40 (Sq. Km) and population of this municipality according to 2068 BS census is 46510. The study area Korak is a village in Rapti Municipality in the Narayani Zone of southern Nepal. Korak lies in province number 3 and is accessible through the Bhandara road that leads to Korak. This region has hilly structured landscape. Mostly Chepangs peoples are living in this region. The area of study i.e. Korak is 31.3 Km east of Bharatpur Metropolitan of Chitwan District and 8.8 km from the then Birendranagar VDC Office of Bhandara. Katlekhola, the main study area, is one of the Leasehold forest areas among the 107 leasehold forests. It consists of 10 households with 60 total population (31 male and 29 female). The main sample area Katlekhola lies in Rapti Municipality where the road towards north of Bhandara leads to Katlekhola of Korak. Travelling in the semi graveled road for about two hour takes us to the sample area.

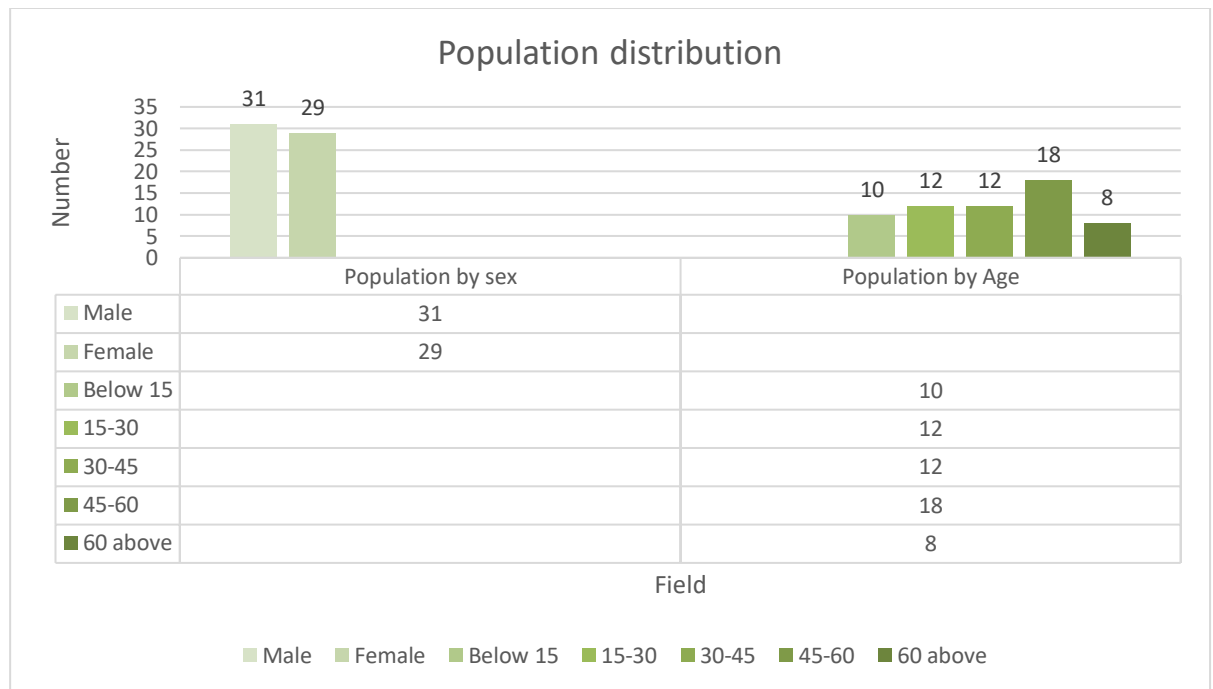
4.2 Socio Economic Information of the study area

For the socio-economic information, the number of people, their religion, education, health economy and other factors as self-reliance, self-respect and people's participation has also been measured.

4.2.1 Population distribution

Firstly, population distribution was analyzed to find out the ratio of male to female population as well as the population by age. This analysis helps in finding out the type of human resource present in the study area. The questionnaire as in Annex I was used to identify the population distribution of the study area.

Figure 3: Population Distribution



Source: Field Study, 2018

In the study area, there was majority of male population but with a very slight margin. The percentage of male and female population as per the field study was 51.67% for male and remaining 48.33% for female population. Other than the population distribution as per sex, the population distribution as per age gave us the idea on dominance of age group of people from 45-60 years. 1/2nd of the total population were in-between age 30-60 and very least 2/15th of the total population (least population) was of the people aged above 60.

With the help of the above data, we can generalize that the majority of people working in the leasehold forestry practice are active age grouped people i.e. aged from 45-60 years and not falling behind is the age group of 30-45 years who are also in great number relatively that are active in leasehold forestry.

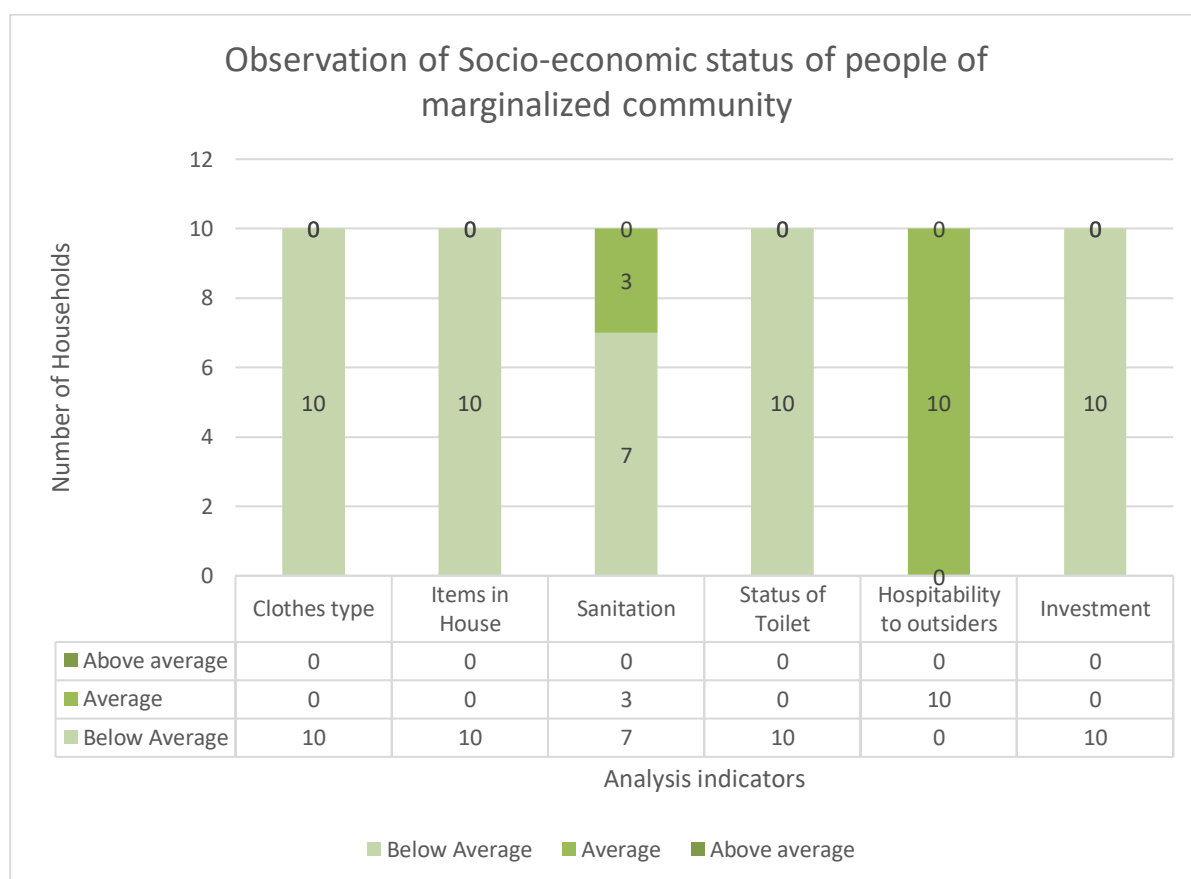
For tackling with the first objective i.e. socio-economic impact of CSA practice in people of marginalized community; Observation, survey and KII were used. During the observation, total of 10 households was observed and the study was further sub-divided into two variables i.e. social and economic variables.

4.2.2 Observation analysis of socio-economic status:

In the study area, the social and economic status of the people was observed with the help of checklist as in Annex IV. The observation done on the socio-economic status of the people helps in clearing out the answers that were presented by the interviewee i.e. to check the reliability of the answers that were presented by the people of that specific area.

Observation analysis in graphical form:

Figure 4: Socio- economic status from observation



Source: Field Study, 2018

In the above table, in sanitation only three had average level of sanitation (medium level of cleanliness on visual basis) and rest all the households had poor sanitation, all the households had poor status of toilets and toiletries, low quality of clothes, presence of low quality of items in house, below average investment. Out of the 6 indicators, their welcome was just satisfactory as they responded well. Lastly, in the socio-economic analysis, all the households have stone-made houses. These analysis

shows that the socio-economic status of the people of the study area was not good and they still had the visual outfit of marginalization.

As per the observation made on the socio-economic impact, there was no direct visual impact of leasehold forestry on the people as almost all the factors were below average. The people, had all the factors as questioned by the researcher below the average point i.e. the point where normal family maintains the level.

4.2.3 Survey Analysis

10 households were surveyed to find out the socio-economic impact of CSA practice i.e. leasehold practice in Katlekhola of Chitwan. To find out the socio-economic impact, different variables had been used as social and economic variable. Among the two, social variable has further been sub-classified into different sub-variables as Social Status of people, Women's participation, Education of the people and health of people.

4.2.3.1 Health Status

The health status of the people was taken in order to find out the social status of those people. With the help of health status, the people's sanitation, their living pattern, their hygiene and their nutritional practice can be cleared out. The health status of the people was measured/ dug out with the help of the questions as in Annex I.

	Disability	Hospital visit (per month)	Air related issues	Disease in Children	Severe diseases
HH1	None	5 people	2 people	None	None
HH2	None	6 people	1 people	None	None
HH3	None	5 people	1 people	1 child	None
HH4	None	3 people	None	None	None
HH5	None	4 people	3 people	1 child	None
HH6	None	None	2 people	None	None
HH7	None	4 people	None	None	None
HH8	None	3 people	3 people	None	None

HH9	None	None	1 people	None	None
HH10	None	2 people	None	1 child	None

Source: Field Study, 2018

In the study of the health status of people, firstly, the disability of people along with the air related issues and issues with children was studied. In the study of 10 households with total of 60 peoples, none had any kinds of disability and none had the severe kinds of diseases. In the average of frequency of hospital visit (per month), almost 2/3rd population visit hospital at least once in a month.

Mean of Hospital Visiting patients in a month: $33/60 = 0.55$

Mean of Hospital Visits more than once by a patient in a month: $5/60 = 0.0833$

Mean of Hospital Visits once every month by a patient: $28/60 = 0.4677$

Among the peoples those visit hospitals more than once every month, the age group is found to be more than 60 and in some cases the age group is found to be below 15. In case of the air related issues, 7 people exceeding 60 year had asthma problem and 7 people around their 60s had other air related issues. In the survey, children's frequency of illness in a month was found to be below 1 (mean visit) and the most common reason for hospital visit was found to be diarrhea and common cold.

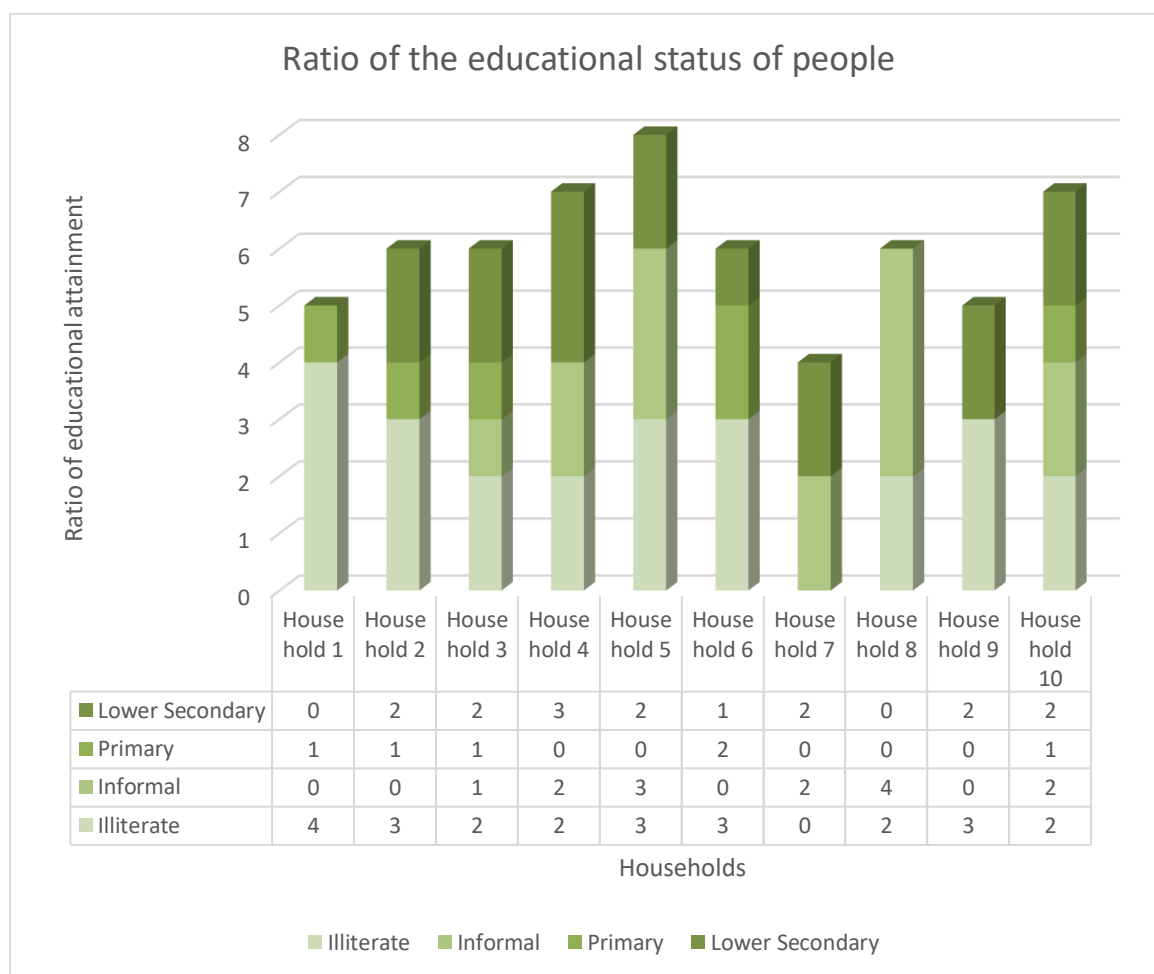
The above analysis gives the clear picture of the status of health of the people of the study area as the respondents didn't have a direct patch-up between leasehold forestry and their health status but their overall health status seems to be in a normal position. There are no any kinds of severe health problems other than some air related problems on old peoples. In case of children, they were found to be affected with very normal types of diseases as diarrhea, common cold, etc.

4.2.3.2 Educational Status

A survey on the educational status of the people was also analyzed so that their socio-economic status could be determined. In the educational status, the people were asked about the educational attainment, dropout and the reasons behind dropout.

Household chart of the people's education

Figure 5: Educational status of people

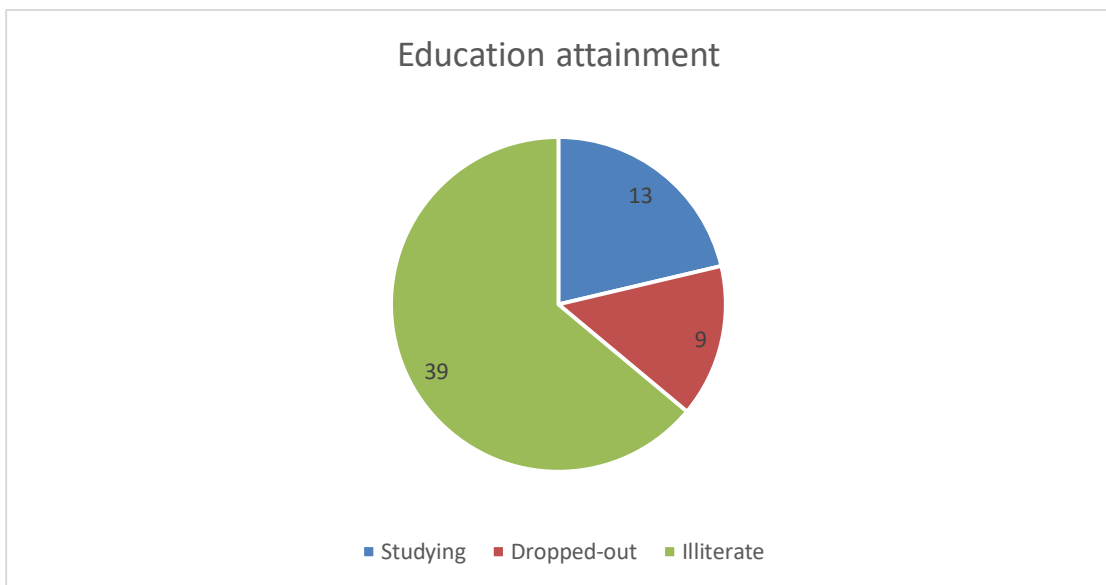


Source: Field Study, 2018

Of the total population, the old peoples were mostly found to be uneducated whereas only the young aged peoples and kids and sometimes middle generation parents (aged 45-55) were found to be literate. Of the total educational attainment 9 peoples had dropped out from their schooling and the main reason behind their dropout was

uncovered to be the least interest in education in relatively older people and family barrier in certain cases in very few young peoples.

Figure 6: Educational attainment



Source: Field study, 2018.

Out of the total population of 60 people, most of them were found to be illiterate as they didn't have adequate educational opportunities in their time.

In the study area, a predominant culture was found as the older peoples were not literate as they were fully segregated from education in their time. Looking at the present generation, all the children are presently enrolled in education. In the generation of middle age, they were mostly dropping out as they didn't have enthusiasm to study rather, they were involved in household activities only.

4.2.3.3 Social Status

In the survey to find out the social status of people, perception, attitude, self-reliance, self-respect and women's empowerment were considered as a factor influencing the social status of people of marginalized community. In the survey, all the household's

perception analysis seems to be good as others had good perception towards them so did, they. Similarly, their act in-front of other people were also normal with the full intrahousehold circle of all the houses. This proved that they were socially friendly and were cooperative in nature.

In terms of self-reliance and self-respect, the people were found have confidence in their work and they didn't have demoralization in their work where they accepted the fact that the work they had been doing was like a culture. Despite the self-respect, more than 50 percent of households were expecting aid from other organizations where financial aid was their major priority.

In the analysis of the women's participation, almost all the women aged above 30 were involved in income generation activity where the type of activity was mostly dependent on forest products. The power to decide was also given to the women in almost all the cases but the power that they possessed was only social power and only a few houses had women with health-related decision-making power.

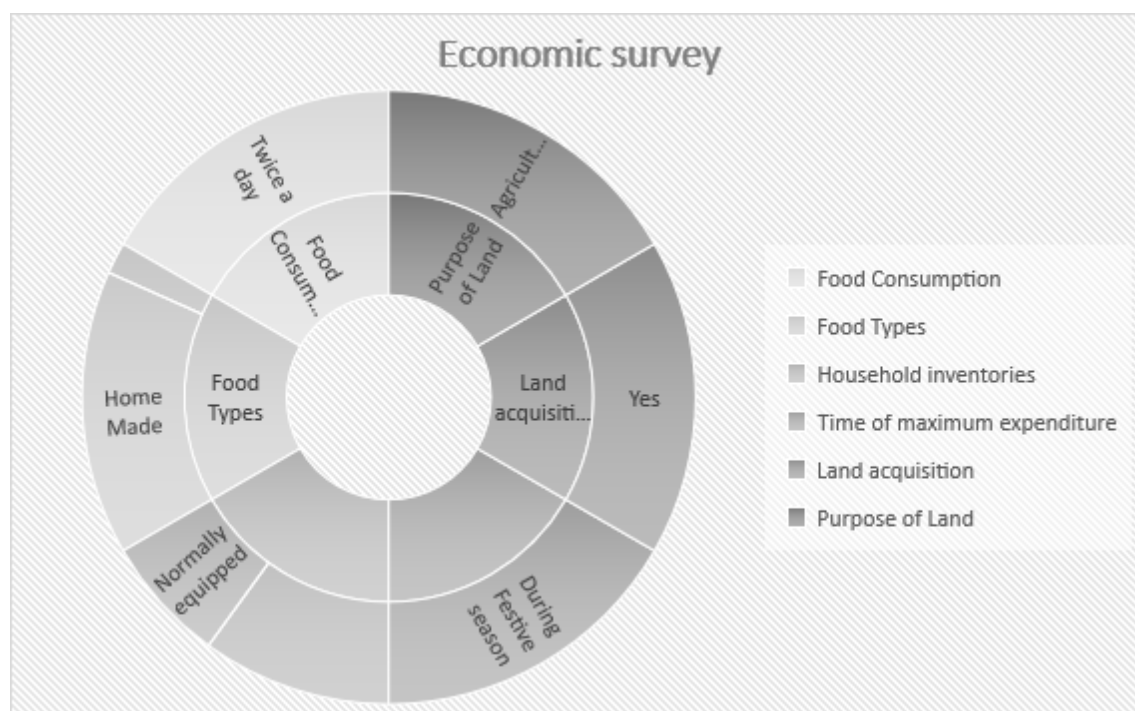
In a conclusion on the social status, the people were found to be socially stable and their livelihood was also found to be sustainable. They were self-reliant and was full of self-esteem. Other than the social stability, women were also stable and were participative in nature. They had the power to decide in one of the dimensions as social dimension.

4.2.3.4 Economic Status

The economic status was also surveyed where year of involvement in leasehold forestry, land area acquisition, saving, food consumption, types and other expenditures were also surveyed. These variables were surveyed in order to find out the economic status of the people using leasehold forestry of Katlekhola leasehold forest user group. In the survey done on 10 households, all of their primary occupation was found to be Agriculture but the agricultural practice was also dependent on forest activity. Their involvement on leasehold forestry almost 8 years as the committee of the user group was formed before 8 years.

Economy

Figure 7: Economy study



Source: Field Study, 2018

After the survey in the economic status, all the households had the land with at least 1-2 bigha minimum from which they were conducting agricultural activity. The people had average type of food i.e. sufficient for their livelihood. Their diet contained foods that were home-made. In terms of inventories mixed types of result was uncovered with 40% people with normally equipped house and remaining 60% with least inventories in house. In the sector of saving, the people had been saving around 1500 in average.

After looking at the economic status we could generalize that the economic status of the people of Katlekhola leasehold forest user group was normal with basics of everything.

4.3.4 General Interview analysis

4.3.4.1 Health of people

In the study of health of people, health official of the area was the key interviewee. In the interview, the health condition was found to be normal. No any kinds of severe cases of health-related issues was found in that area. The only thing that has to be taken care was the nutrition, where it was deficient in some children. Due to the food habit, the nutrition was inadequate or more than adequate. Examining the number of people and their frequency of visit to the hospital, it was also normal as they had an average of 4-5 visits for the whole community in a single month. Another normalizing fact is that the people who come for the treatment are mostly for the normal types of diseases as flu, diarrhea which happens due to bad sanitation as well as bad hygiene.

4.3.4.2 Education of people

The teacher of the school of the study area was the main interviewee as she was the main person who had the superficial idea on the present as well as past status of the people of the study area.

The people of the marginalized community in the past didn't have appropriate educational facility. This had caused them to be illiterate in the past. But the present scenario is different as they have access to school and can study as per their will. The drop-out has decreased exponentially as compared to the past records. In terms of absenteeism among the students; due to the inconsistency in the frequency of absenteeism, there is no idea on the average of the presence of the students in class per year. Other than these factors, the poverty as well as lack of facility in school might have been playing a crucial role in decreasing their grades in education but their willingness to study is equal to other children.

4.3.4.3 Women's participation

The study on the women's participation and women's status was found to be normal with no any cases of violence against women. Women were given the right to participate in decision making processes. They had the freedom to speak in the house as well as outside of their house. They were also involved in income generation activity i.e. forest activity as well as agriculture.

Final Interpretation in Objective 1:

From the above discussion and analysis, the socio-economic status of people of Korak of Chitwan i.e. Katlekhola leasehold forestry user group seems to be normal. With the

involvement of women in economic activity and in social decision-making process, their level in a family is in the threshold region i.e. not below the level. Other than the status of women, the educational attainment seems normal as the community are getting more chances of education presently.

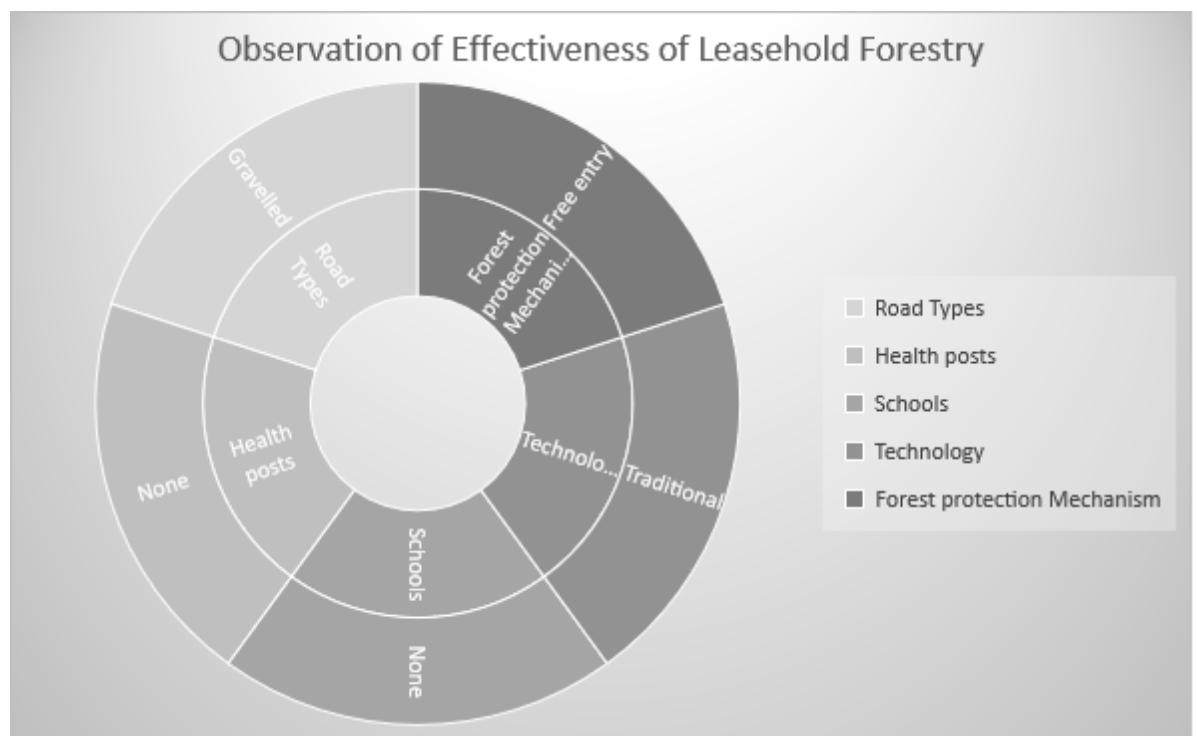
4.3 Effectiveness of Climate Smart Agriculture Practice

To measure the effectiveness of CSA practice i.e. leasehold forestry; survey, observation and KII was conducted with the local peoples. Effectiveness of CSA practice i.e. leasehold forestry has been measured by comparing their past and present status.

4.3.1 Observation Analysis

The observation made on 10 households of Katlekhola Korak has brought about a result that has shown no any kinds of infrastructures change with the help of leasehold forestry and but has recorded a change in the forest that was leased.

Figure 8: Effectiveness of Leasehold forestry



Source: Collected from survey, 2018

In the observation of the study area, there was no any kinds of infrastructural change seen. No new infrastructures had been developed after the introduction of leasehold

forestry. Moreover, there is use of traditional technology in the study area as per the observation. There were no schools in the area, neither were there any kinds of health services. In terms of access to the forest, the people had free access to the forest as the forest was on their ownership.

4.3.2 Survey Analysis

In the survey only one question was prepared as in Annex I i.e. about the preservation of the forest and all the households without any hesitation has agreed on the fact that the forest area has been preserved due to the use of leasehold forestry.

In the question that revealed how effective the leasehold forestry is in protecting the forest area, all of the 10 respondents responded that leasehold forestry definitely helps in saving the forest area. With the introduction of leasehold forestry, the forest has grown denser and greener than before.

4.3.3 Interview Analysis

4.3.3.1 Change in people's life

The economic status and social status of the people after their engagement in leasehold forestry has been dug up. In the analysis, key persons related with the leasehold forestry i.e. the main person who has been handler of the leasehold forest was interviewed where the interview questionnaire is presented in Annex II.

After the use of leasehold forestry, the people has been adding some penny to their piggy bank. They, before the use of leasehold forestry had to be totally dependent on agriculture but after the introduction of leasehold forestry in their life, they have been able to add a extra in everything. Despite the fact that the Leasehold forestry has not been able to bring a great deal of change in livelihood, but it has been a plus to the then lifestyle of people of Katlekhola. In the recent time; people have been adding animal husbandry to their past pattern. They are also engaged in bamboo production from the forest area, they have been rearing livestock which have directly invested in their livelihood.

Talking about the social status, people have been living in their free will. They are feeling more secured than before as more scope of earning has been added. In terms of health and education, their capacity to afford for these two assets has been added with the help of leasehold forestry.

With the above data, we can conclude that the leasehold forestry has been increasing the income of the people by helping them work in multiple sectors of earning. Not just the earning, this has also helped the people to raise their social status than before as they are now indulged in their own self-sustaining activities as well (use of leasehold forest to produce income generation inputs).

4.3.4 KII analysis

4.3.4.2 *Change in Nature*

For finding the change in the forest area, KII was conducted with the Leased forest official as in Annex III. After the introduction of leasehold forestry, the almost barren forest area (forest with only big trees but with no other shrubs and plantlets have now grown thicker and denser. The forest with the proper utilization has been preserved to the level that makes it sustainable. There is no stopping the locals or the user groups to use the forest but they are preserving and promoting the leasehold forest as the forest is their own property. The leasing process is one of the best practices and it increases the selfness in the local people about the forest resource. The environment; with the increased density of the forest; has become very healthy, sound and relaxing. The environment has become very good to live in.

In terms of change in nature, leasehold forestry; by indulging a patch of marginalized people; helps in restoring the status of the almost barren forest or almost degraded forest area. Not just restore, this practice also helps in improving the quality of the forest that was once in a normal condition.

Final Interpretation on Objective 2:

After the analysis of the data in the KII, survey and observation, there is clear indication that the leasehold forestry has been helping the forest area to be preserved. Not only the preservation, this area of forest has been helping the poor and marginalized people to uplift their living style to some extent. The use of leasehold forestry has been helping a forest that is under vulnerability to come to its natural form by helping the helpers to increase their living standard.

4.4 Different CSA practice in study area

For this objective i.e. the applicability of other CSA practices in Nepal, literature review has been done along with interview with the local respondents. Some clips and some books along with the interview have been the main source of data for this

objective fulfillment. Observation was also made in the study area along with some interviews with the locals to find out the other CSA practice that can be used in the study area as in Annex VI.

4.4.1 Analysis

In case of country like Nepal, where there is diverse kind of land structure as well as diverse weather pattern, many types of Climate Smart Agriculture practices are possible. Leasehold forestry being one of them has been an effective practice since its implementation. The practice of leasehold forestry has been in action since late 19th century in Nepal by Nepal Government but FAO started it since 2004 A.D. Since the start of leasehold forestry, it has been a success as it has been able to densify the forest that were almost depleted and degraded.

Other practice of Climate Smart Agriculture includes the water harvest system. In the water harvest system, water is kept secured to be used when water is not available. There is possibility of water harvest in the places where there is no irrigation facility.

The people of those area can help themselves by the following measures:

4.4.1.1 Methods in use

4.4.1.1.1 Plastic ponds

This type of pond can be used to store rainfall in the rainy season and use it in the dry season when there is deficiency of water. The study area also used the plastic pond so that in the time of deficiency of water, they could use the preserved water to water the plants/ crops. They used following procedure to save water for future use:

Here a small pond is made by the use of plastic in the base so that the land doesn't soak up the water. Then the top layer is also covered by a sheet so that the sun doesn't evaporate the water. Then during the rainy season or other times when there is enough water, they fill up the pond. Not only the rain water and the fresh water, the water that were used by them in their day-to-day chores were also used as water after washing clothes, cleaning dishes, etc. This water was used by the people on the dry season to water the vegetables that they had planted for their consumption.

4.4.1.1.2 Multi water use system

This is another major type of water harvesting technique that can be followed in the water deficient zone. The people can store the water used and then use it to another purpose as the water that is accumulated from bathing or washing clothes can be used in the agricultural field.

In the study area, the people had been using this technique as well. The people, with the use of plastic pond, had been storing the water that they used in one place to another place. The water that was used for cleaning dishes and also washing clothes were preserved rather than thrown away and was then used for watering the vegetables.

4.4.1.2 Methods that can be used:

4.4.1.2.1 Drip-irrigation technique

This is another technique where only drops of water is provided to the field and the crops so that there is no wastage of the water thus used.

Drip irrigation has still not been in practice in the study area but can be a best alternative if they are to save water. In this system, a small pipe is fixed alongside the roots of the vegetables. The pipes have holes in the place where there are vegetables or crops. When there is need to water the plants, the droplets of water come out of the holes and the water droplets directly goes to the root of the plants thus nourishing the plants and reducing the wastage of water (due to evaporation from spots where there are no plants).

4.4.1.3 CSA practice from six other practice done in Asia

In context of the other practices that can be used in Nepal from the six other practices of Asia, Literature review was done. The questions dealt was to find out the applicability of the other CSA practice among other six practices in the study area.

In the general finding, most of the practice were focused on using water for agriculture and production of marine life that helps in restoring the environment. The only option that can be used in the study area was vertical farming.

4.4.1.3.1 Vertical farming

Vertical farming i.e. farming in vertical zone so that less area is occupied and more production is brought with the use of less amount of water. Due to lack of water we have to use it wisely. Luckily, we have terrain that is similar to the vertical farming style. Here a big field covers very small parallel area as the field are inclined. This can be an advantage to the vertical farming system. Moreover, the concept of vertical farming can also be used in houses i.e. in the rooftops of houses. This helps in self-subsistence of the family and also increase the production.

CSA practice in agriculture sector:

After the interview with the local respondents, no any major trace of change in agricultural pattern to tackle the changing environment has been found. The people were unaware of the total change in the agricultural pattern to tackle the climate change. Rather they were of the opinion that they had some time change in plantation of the crops as they had to wait for rain to start in some season and had to wait for the rain to stop in some season.

Final Interpretation on Objective 3:

With the above idea, there are possibility of other Climate Smart Agriculture Techniques in Nepal as well. The people has been using a few techniques to adapt to the changing climatic condition and there are more techniques that people can use to increase their adaptation capacity. There has also been a small change in the pattern of agriculture in the people as an adaptative measure to climate change but this has not taken its major shape in the agriculture pattern. Due to the decreasing production and the increasing temperature; the available space, manpower and the resource has to be used wisely. One of the ways is the use of Climate Smart Agriculture techniques.

CHAPTER FIVE: SUMMARY, CONCLUSION AND SUGGESTIONS

5.1 Summary

As for partial fulfillment of requirement for master's degree, thesis on "Assessment of Climate Smart Agriculture- Study on Korak of Chitwan" was prepared. This topic is solely based on Korak of Chitwan and more specifically Katlekhola Leased forest user group which is spread in area of 5.5 hectares. To assess the climate smart agriculture three major objectives were set as to find out the socio-economic status of the marginalized people of the study area, to find out the effectiveness of leasehold forestry in the user group and finally to evaluate the different practices of CSA in the study area. The first objective has been prepared in order to find out how the status of the people is in current time whereas the second objective has been prepared to check whether the leasehold forestry (CSA approach) has helped to change the status of the people. Lastly, the final objective has been prepared to check whether other Climate smart agriculture approaches are implemented and whether other CSA approaches can be implemented on study area or not.

Firstly, Korak was considered as the main sampling frame among which Katlekhola leased forest user group were selected by purposive sampling technique. Katlekhola being one among the 107 leased forest of Rapti municipality, has been taken as the main sample of the study. Whole population of Katlekhola i.e. 60 people were the respondents in this study. As for completing this thesis, qualitative data has been used in most parts with the mix of quantitative data. The data has been collected from primary source i.e. with the help of field survey and analysis. With the help of descriptive method, the data has been arranged in the analysis part.

From the field survey, first impression that we got is the situation of the leased forest. The situation of leased forest is the most recognizable thing that we can see in the study area. The forest looked green and dense and the people had been using some agricultural crops (forest related as small bamboos, kutcho, etc. and also had abundant green leafy plantlets for animal husbandry. Not only this the field of the people could be seen with some small timbers from the forest that was used for vegetables.

In the study of the socio-economic status of the respondents i.e. the socio-economic impact of leasehold forestry in the livelihood of the marginalized people, there was some change in the livelihood of the marginalized. Analyzing the health of the people,

the people had no any kinds of air related issues i.e. in the age group that were a perfect human resource (before 60). The children were not too much infected with diseases other than simple diseases that were caused due to improper sanitation. In the analysis of the social status of the people, they were living a moderate lifestyle which could rather be understood as average according to the lifestyle of the marginalized peoples. The self-belief and self-reliance of the people of that area was also normal. Talking about the economy of the marginalized group, the economy was lower than average with almost no or very mere saving per month. The clothing, housing and fooding seems to be normal as per the standard of the marginalized people. So, overall status of the marginalized people of Katlekhola leasehold forest is found to be average with nominal living style and standard.

The effectiveness of climate smart agriculture practice i.e. leasehold forestry was sought for solving the objective of effectiveness of CSA practice. After the use of leasehold forestry, the forest area has become more denser and greener. The almost barren forest has experienced a drastic change. Talking about the livelihood of the people, the people had increased their income. They had been saving certain sum of their income. There is not much increase in the money thus earned but the women have been participating in the income generating activity and all the people have also got more scope of working so that their economy could be increased. So with the help of leasehold forestry, the people has been benefitted in-terms of social benefit (women's participation) and partially in the economic sector as well (very minor increase in economy) but has got a new dimension of earning (with the forest product as well as domestication of animals i.e. livestock).

In the objective to find out other CSA practices that are in practiced` and that can be practiced, we tested the effectiveness of other Climate Smart Agriculture practice in the study area. Different literatures were reviewed along with videos were also consulted to clarify about this objective. In the review, other climate smart agriculture practice like multi-water use system, plastic ponds and drip irrigation, vertical farming etc. can be used. In the present time, due to shortage of water agriculture and lifestyle has become more and more tedious. So, to solve that issue, water preservation system has to be used. In the study area, water preservation system i.e. by plastic pond and multi water use system has been in practice. All of the people has been benefitted with the help of these practices as the shortage of water has reduced to

some extent. Besides the present use, other practices are also possible in the study area. The practice of vertical farming is much more suitable in the area as the area is also sloppy and has less water at their disposal. So, if they use the vertical farming technology as one of the CSA approach, then agricultural production will surely increase.

5.2 Conclusion

In a nutshell, we can conclude that the leasehold forestry has been helping the marginalized people get new scope of their economic activity. Unlike community forestry, leasehold forestry gives access to the marginalized people and their community to protect, promote and use the forest area. Due to this fact, leasehold forestry is more effective way to enhance the livelihood of the people.

When leasehold forestry is used, a group of marginalized people get a single patch of forest area. With their involvement, the forest area is refurbished. The by-products of the forest are open for the marginalized people to use. They lease the forest with terms of serving the forest to regenerate as well as use the forest product. Not only the by-products of the forest, the leasehold forestry helps in expanding the agricultural field of people in the sense that the people can densify the forest with some agricultural crops with economic benefit. With the expansion and production of the agricultural field, the economy of the people will definitely expand.

Other than the economic activity, the participation of the people also increases. With the leasehold forestry, the human resource will have to be mobilized in a perfect way as to balance the past economic earning activity and newer scope of economy generation activity. So, the women will also get indulged in the forest products production as well as utilization activity.

With this practice the forest area gets the time and perfect nutrient to regenerate. With the idea of protection and usage, the forest gets rejuvenated. The marginalized peoples protect the forest area and also promote the forest area accordingly. This helps in protecting the forest area as leasehold forestry is of the opinion of sustainable utility.

Climate Smart agriculture is a new technique that helps in adaptation to the present climatic condition and developing in the present condition as well as using some energy in tackling the climate change. With climate smart agriculture, the agricultural

practice is leapt forward in such a way that people can produce the same amount and same quality of agricultural crops despite the unfriendly climatic condition.

5.3 Suggestion

As for the suggestions to the findings of this research, following suggestions have been presented:

General Suggestion:

1. Leasehold forestry must be used in most of the parts of rural Nepal as it helps in improving the status of forest as well as it helps in making the marginalized people more developed.
2. Due to the global warming, most of the production has now diminished so to tackle with this scenario, Climate Smart Agriculture techniques has to be in effect where agricultural production increases thus improving the livelihood of the people.
3. The changing climate has impacted in shortage of water and also drought in some places, so water preservation system as well as multi-water use system is a must in the present situation.

Academic Suggestion

4. Study on different climate smart agriculture techniques have to be done in such a way that it can be implemented in context of Nepal. In developing country like Nepal, where there is more dominance of agriculture, due to global warming, the agricultural production has been diminishing. So, future researches must be based on uncovering the best approach to be used to tackle this situation.

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Formal: Primary= A, Lower secondary= B, Secondary= C, Higher Secondary= D, Bachelor += E, Informal= F, Illiterate= G.

Occupation:

A= Business, B= Agriculture, C= Remittance, D= Sales of forests' products, E= Forest related self-entrepreneurship, F= Others

Health status

M	Disabilities	Type of disability (if present)	Any kinds of severe diseases ?	Frequency of hospital visit (per month)	Any air related issues in health?	Children's frequency of illness (per month)	General type of diseases in children
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Symbol:

Disability:

Y= Yes, N= No

Type of Disability:

P= Physical Disability, M= Mental disability

Diseases in Children:

A= Diarrhea, B= Common Cold, C= Flu, E= Vector Borne diseases,
 F= Air borne diseases

Air Related Issues:

A= Breathing Problem, B= Problem in lungs, C= Asthma

Educational status

S. N	Present enrollment	Dropout	Dropout (at level)	Dropout Year	Reason of dropout
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Symbols:

Dropout

Y= Yes, N= No

Reason of Dropout:

A= Family barrier, B= Not interested in education, C= Physical (relates to body) difficulty, D= Mental challenges E= Others

Economic Status (For 1st objective- economic dimension and 2nd objective- Change in livelihood)

H. N	Family's Occupation	Primary	Year of Involvement in Leasehold forestry

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Year of involvement

A= less than 4 years

B= 4 to 8 years

C= 8 to 12 years

D= 12 to 16 years

E= more than 16 years

- Do you acquire any kinds of Firms?
 - Yes _____
 - No _____
- If yes, what kind of firm do you acquire?
- Do you have the acquisition to any land (for conducting economic activity such as agriculture as well as sales of asset for conversion to another form of asset)?
 - Yes _____
 - No _____
- If yes, what area of land do you acquire?
- What is the main purpose of the land area that you acquire?
 - A= Business
 - B= Agriculture
 - C= Livestock
 - D= For exchange of asset (selling for gaining other type of asset)

For expenditure

H. N	Saving (monthly)	Food consumption	Food types	Household inventories	Other expenditures	Time of year for maximum expenditure

Symbols:

Food consumption:

A= 1 time a day

B= Twice a day

C= More than two times

Food Types:

A= Home Made

B= Purchased

Household inventories:

A= Normally equipped

B= Least inventories

Note:

Normally equipped states the presence of bed for individuals, television/radio, kitchen pots, rugs, general furniture, etc.) and

Least inventories mean equipment of fundamental required materials only such as pots, simple rugs, etc.

Time of year for maximum expenditure (based on the festivals or rituals).

Social status of people

S. N	Topic	Answer	Relates to	Go to
1	People's perception towards them	Like them Dislike them	People' perception to marginalized	
2	Their perception towards other peoples	Like them Dislike them		
3	Maximum intra-household circle		Their attitude	
4	How people act in front of them?	Normally Abnormally		
5	How much help do you seek from neighbors?	Maximum Normal Minimum	Self- reliance of the marginalized	

6	Expecting aid from any other people or organization?	Yes No	people	
6.1	If yes, why and what kind of aid are you expecting and if no, why not?			
7	Any time of demoralization on your own work?	Yes No	Self-respect of Marginalized	Go to 8
8	Why?			
9	Do you have confidence on what you are doing?	Yes No	Self-respect of Marginalized	
9.1	If Yes why and if no why?			
10	Decisive power of women in family?	Yes No	Women's empowerment	If yes, go to 11
10.1	If no, why?			Skip 11
11	What kind of decisions can women make?			
12	Females' involvement in family income generation activity	Yes No		If yes, go to 13, else go to 14
13	Activity where women are involved?			
14	Number of women involved in economic activity? (household)			
15	Time of involvement of women			

Symbols:

Decision power:

A= Social decisions

B= Economic decisions

C= Cultural decision

D= Educational decision

E= Health related decision

Activity of Women's

A= Entrepreneurship

B= Sales of forest products

C= Agriculture related activity

D= Others

Qn. 5

Maximum= Requires help from neighbor more often (most of the activities)

Normal= Requires neighbors help sometimes in needs only

Minimum= Requires neighbors help in dire situation only

Time of Involvement

A= Full time

B= Part-time

2nd objective**Effectiveness****Change in livelihood**

Economic change: For this variable, the questionnaire of the economic dimension will be used.

Natural change

- Do you think the forests under your control are being preserved or promoted?
 - Yes
 - No

Annex II: Interview Questionnaires

Objectives	Dimension	Variable		Respondent
1st	Social	Health of people		Health care officials in nearby health posts
		Education of people		Teachers in nearby schools
2nd	Effectiveness	Change in Livelihood	Physical change	Local Respondents
			Economic change	
			Natural change	
		Condition of leasehold forests		

1st objective

Social dimension

Health of people

- What is the present health condition of the people of the sample area?
- How many patients (in average from that particular group) come to this health center in a month?
- Are most of the patients here for simple disease or complex?
- Any kinds of health risk factors that you see in the people of sample area?

Education of people

- How enthusiasts are the people of that area to come to school?
- What is the average day of attainment of school of the students of that area?
- How is the study of the students of that area?
- Are the students of research area fully faired with school equipment?

2nd Objective

Effectiveness:

Change in livelihood:

Physical change

- What infrastructures have been added in this area in recent time?
- What technological change have you observed in recent time?
- Any change in the housing pattern of the area?

Economic change

- What kind of change have you felt in your economy after the introduction of leasehold forestry?
- Any kinds of increase in the lifestyle or savings from your income in recent time?

Natural change

- What change in nature have you felt after the introduction of leasehold forestry?
- What is the present condition of leasehold forests in your area?

Condition of Leasehold forests

- What is the present condition of leasehold forests?
 - The size,
 - The density,
 - Condition.

Annex III: KII guidelines

Objectives	Dimension	Variable	Respondent
1st	Social	Women's participation	Women's leader in that area
2nd	Effectiveness	Condition of Leasehold forest	Forestry officials

1st objective

Social dimension

Women's participation

- What is the present situation of women of sample area?
- Are the women participating in decision making as well as income generating processes?
- Are there any kinds of issues related with violence against women?
- Any kinds of act of women's suppression?

2nd objective

Effectiveness

Conditions of Leasehold forest

- What was the previous situation of Leasehold forest area?
- What change have we felt in that specific area?

Annex IV: FGD Agendas

Objectives	Dimension	Variable		Respondent
1st	Economic	People's income		Local Peoples using leasehold forestry
2nd	Effectiveness	Change in Livelihood	Physical change	
			Natural change	
		Condition of leasehold forests		

1st objective

Economic dimension

People's income

- What gain in income have you realized after using leasehold forestry?
...
- What features have you been able to add to your life in the recent time?
...
- What educational level have you been providing to your children?
...
- What investment have you made in recent times (if any)?
...
- What benefits are you getting from leasehold forests?
...

2nd Objective

Effectiveness:

Change in livelihood:

Physical change

- What infrastructures have been added in this area in recent time?
- What technological change have you observed in recent time?
- Any change in the housing pattern of the area?

Natural change

- What change in nature have you felt after the introduction of leasehold forestry?
- What is the present condition of leasehold forests in your area?

Condition of Leasehold forests

- What is the present condition of leasehold forests?
 - The size,

- The density,
- Condition.

Annex V: Observation checklist

Objectives	Dimension	Variable		Respondent
1st	Social	Social status of people		Local Peoples using leasehold forestry
		Health of people		
		Women's participation		
	Economic	People's income		
2nd	Effectiveness	Change in Livelihood	Physical change (infrastructure change)	
		Condition of leasehold forests		

1st objective

Economic dimension

1. Types of clothes people wore:
 - a. Low quality
 - b. Medium quality
 - c. High quality
2. Condition of items present in people's houses:
 - a. Low quality
 - b. Medium quality
 - c. High quality
3. Material for building the house
 - a. Concrete house
 - b. Stone made house
 - c. Bamboo and sheet house
4. Sanitation status of the houses:
 - a. Dirty household area (includes smelly environment)
 - b. Medium level of cleanliness
 - c. Very clean (no flies, no smells, no wastes in house area)
5. Status of toilet and toiletries:
 - a. Clean toilet with toiletries equipped
 - b. Average toilet with average type of toiletries (toilet looking average)
 - c. Poor condition of toilet and toiletries (smelly and dirty)

6. Type of business they were enrolled in:
 - a. Low Budget (less than 50000 investment)
 - b. Average Budget (50000 to 200000 investment)
 - c. High Budget (more than 200000 investment)
7. Hospitability to outsiders
 - a. Warm welcome with good response level
 - b. No welcome with average response
 - c. Didn't want the presence of outsiders

2nd objective

Effectiveness

Change in livelihood

1. Types of roads in that area.
 - a. Graveled
 - b. Black-topped
2. Health posts in the area
 - a. None
 - b. Only 1
 - c. More than 1
3. School in that area
 - a. None
 - b. Only 1
 - c. More than 1
4. Technological advancement of that area
 - a. Traditional technology
 - b. Modern technology
5. Forest protection Mechanism
 - a. No entry to the locals
 - b. Entry but with limited access to the resources
 - c. Free entry and free access

Annex VI: Observation, Interview and Literature review

Objectives	Dimension	Variable	Respondent
3 rd	Applicability and application of other CSA practices	Present use and future potential	Local peoples and literature review

3rd objective

Viability

Applicability of different practices of Climate Smart Agriculture as practiced in Asia in context of study area

- What practices have been used in the study area (other than leasehold forestry)?
- How are they being profited by the use of other practice?
- Is it possible and viable for us (study area) to import and use all the six other CSA practices (as in Literature review) that are done in Asia?
 - Which one of them (other than Leasehold forestry) has to be brought to practice in context of Nepal and why?
 - How many of the six can be used in context of Nepal?

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