CHAPTER- I

INTRODUCTION

1.1 Background

The name Yarsagumba is originated from Tibetan language where `Yarsa` means `Summer grass` and `gunbu` means `winter insect'. The scientific name of this herb is Cordyceps sinensis. Yarsagumba, also known as the 'Himalayan Gold' is renowned for its high valued medicinal herbs. It is found at high altitude between 3500m to 5500m above sea level (Chhetri, 2014). Basically, Himalayan regions of Nepal, Bhutan, India and Tibet are famous for Yarsagumba. Secondary sources reveal that Cordyceps sinensis is available mostly in central and western Himalayas of Nepal (Devkota, 2006).

Agriculture is the major sector of Nepalese economy. About 67 percent of Nepal total economically active population is engaged in agriculture as the main occupation. The current share of agriculture in Gross Domestic Product (GDP) is about 31 percent. Nepal is an agrarian society and most of its inhabitants are engaged in subsistent agriculture (MoF, 2016/17).

An overwhelming majority of the poor in the Hindu Kush Himalaya (HKH) live in rural areas and depend heavily on nature-based goods and services, including forests and non-timber forest products (NTFPs). The contribution was greatest in Nepal (21%) and lowest in Himachal Pradesh, India (15%). Yarsagumba or Yarchagumbu is an exceptional and incredible herb that grows in the pastures above 3,300 meters up to 4000 meters in the Himalayan regions of Nepal, Bhutan, India and Tibet.

Yarsagumba (OphioCordyceps sinensis) literally means summer plant and winter insect (dong cong xia cao) in Tibetan. Its Tibetan name Yarsagumba first recorded by Tibetan doctor Zurkhar Namnyi Dorje in the fifteenth century, and then is found in the books of "Bei Cao Cong Xin" written by Yiluo Wu (1757AD) and "Ben Cao Gang Mu Shi Yi" written by Xueming Zhao in 1765 AD (Zhou, 2013).

The name Cordyceps sinensis came from the Latin words, i.e. Cord denotes “club”, ceps is “head”. The parasitic fungus Cordyceps sinensis is variously known as Yarsagumba, Kira, Jeevanbuti, Yarchagumba, caterpillar, etc. It tastes “Gang Ping” (sweet flat), and its functions were “beneficial for lung and kidney, activating blood circulation to dissipate blood stasis and treating virtual cough and haemoptysis”. Based on the description of Pharmacopoeia of the People`s Republic of China (2005), the DongCongXiaCao (DCXC) is functional on curing impotence, spermatorrhea and the resolving pain in the knee and waist. Besides, modern medicines have proved that it possesses some functions such anti-tumour, anti-hyperglycemia (Lo et al., 2006) and significant improvement of the body`s immune function (Paterson, 2008; Zhou et al., 2009; Zhu et al., 1998). Up to now, the medicinal and economic values of DCXC have been widely realized and studied in the world (Weckerle et al., 2010; Winkler 2008, 2010; Zhang et al., 2009b).

In Nepal, large groups of people can be seen climbing higher up the snow-capped Himalayas, carrying blankets, and tents and cooking materials. Schools are closed and entire villages are emptied, aside from the elderly and the sick who cannot handle the harsh, steep and long trek thousands of meters above sea level. When the annual Yarsagumba harvesting season hits, all available hands and eyes become engaged in the lucrative hunt. In Nepal, more than 50 percent of the household in every village are involved in collection of Medicinal Aromatic Plants (MAPs) for sale since last 15 years, and there is growing interest to study medicinal plants in search of new medicines backing up to traditional practice (Ojha, 2000).

Nepalese authorities lifted a ban on harvesting and selling of Yarsagumba in 2001, spurred by the impossibility of preventing its trade in a secluded, mountainous landscape. The nation is now the second largest supplier to the global market after Tibet, and although much of the trade still occurs secretly, the government collected about 5.1 million rupees in taxes (roughly $52,000) from the industry in 2011/2012.

Though the area of plants and grass lands occupy less than 10 percent of the total land, Dolpa district has provided an important measure of herbal resources (Dhakal, 2006). Yarsagumba is the second biggest contributor to household income, after farming, with 70 percent of people in the region harvesting the resource (DFO-Dolpa, 2012). In the 2010 picking season an estimated 50,000 people were involved in the harvest. The study found that caterpillar fungus is the biggest contributor to the cash economy of the poorest people, playing a key role in alleviating poverty by allowing isolated highland families to send their children to school, buy food, and pay off debt.

Yarsagumba is distributed in the alpine region of the Himalayas at the elevation of more than 4000m. It grows in Nepal, mainly found above the snowline in Dolpa, Jumla, Humla, Kalikot, Baglung, Mustang, Manang and Rasuwa districts of western and central Nepal. Also found in Countries such as Tibet, North-East India (Himachal Pradesh and Uttarakhand Himalayas), China and Bhutan. Yarsagumba has two components the lower part is dead caterpillar and the upper part is a fungus. The fungus has a small spike with dark brown fructification and yellowish white stalk. The size of the fungus is about 4 to 12 cm in length and 0.14 to 0.40 cm in girth. Yarsagumba with both the caterpillar and fungal part in an intact single piece is an item of commerce (Gupta, 2017).

For commercial purpose, Yarsagumba has the highest value than any other herbs. Numerous scientific studies and medical research reveals that Yarsagumba is effective against various diseases like tuberculosis, cancer, anaemia, leprosy, leukaemia, hepatitis B and Diabetes. Moreover, it improves memory and keeps a person physically and mentally sound (Devkota, 2006).

Globally, more than 500 species of Yarsagumba are found. But, in Nepal, about 11 types are identified. Among them, OphioCordyceps sinensis is the most popular (Chhetri, 2014). Nepal is the second largest exporter of Yarsagumba (on an average about 3000kg), after China (accounts for 95%) of the global trade (NRB, 2015). In Nepal, Yarsagumba collection has been taking place in almost 25 districts. But, commercial collection is carried in 12 districts namely Darchula, Dolpa, Jumla, Mugu, Bajhang, Rukum, Myagdi, Manang, Gorkha, Rasuwa, Sindhupalchwok and Sangkhuwasabha. Among them, the Yarsagumba found in Dolpa District is of the best

quality (NRB, 2015). Similarly, the revenue contribution of Yarsagumba collection from Dolpa district is very significant compared to other districts (DoF, 2011).

Yarsagumba is a costly medicine commonly used in China. Chinese used as an antiaging medicine, and also used for kidney, lung and heart ailments, male and female sexual dysfunction, fatigue, headache, toothache, cancer, hiccups and serious injury to relieve pain and the symptoms of tuberculosis and hemorrhoids to restore general and appetite and to promote longevity (DFO-Dolpa, 2011).

In recent years, the collection of Yarsagumba has decreased, but, the price of Yarsagumba has increased drastically. Every year thousands of people go for the Yarsagumba collection in Dolpa district. So, people have been able to generate income through Yarsagumba collection, opening hotels, selling goods, operating new business through the income generated from it. On the other hand, the schools are closed during the season of Yarsagumba collection. Furthermore, the case of theft, excessive drinking and gambling among youths have also increased significantly. So, the study related to Yarsagumba collection in Dolpa district is very essential from the Nepalese economy perspectives.

1.2 Statement of the Problem

In Nepal, Yarsagumba collection has been taking place in almost 25 districts. Legally, Yarsagumba collection has been started from 9 districts namely Dolpa, Darchula, Jumla, Mugu, Sindhupalchowk, Rukum, Dhading, Jajarkot and Bajhang. Nepal is the second largest exporter of Yarsagumba (on an average about 3000kg), after China (accounts 95 per cent) of the global export (NRB, 2015). The official statistics at department of forest shows that 3.1 Kg of Yarsagumba was traded or exported in 2001 A.D. and was increased to 2242.42 Kg in 2008 A.D. Similarly, the revenue collection was Rs. 62,000 in 2001 A.D. and Rs. 2, 24, 24,200 in 2008 (DoF, 2011).

The Yarsagumba found in Dolpa district is of high quality and accounts for the 40 percent of the national supply (NRB, 2015). Similarly, the revenue contribution from Dolpa district accounts 57 percent of the total revenue from Yarsagumba collection (DoF, 2011). However, the people say that the Yarsagumba collection is decreasing and its demand in the international market is increasing. So, what is the present status of Yarsagumba collection in Dolpa district? Under this, the study aims at identifying number of year's involvement in Yarsagumba collection, source of financing Yarsagumba collection, expenditure incurred on Yarsagumba collection, activities foregone due to Yarsagumba collection and the problems faced during Yarsagumba collection.

Every year more than 60 percent of total population of Dolpa district go in search of Yarsagumba collection in Dolpa district. The research studies shows that Yarsagumba income accounts for the 65.0 percent of total cash income (Shrestha, 2012). The livelihood of the mountain people are highly dependent on Yarsagumba collection. However, the livelihood of the mountain people have not improved much. Hence, the study analyses, what is the contribution of Yarsagumba collection in income generation of the mountain people. Similarly, what is the expenditure pattern of income generated from Yarsagumba collection?

With the lifting of ban on Yarsagumba collection in 2001, the number of people going for the Yarsagumba collection is drastically increased. There are multiple of stakeholders involved across different channels of Yarsagumba collection. So, what is

Yarsagumba trade and trade chain mechanism? Under this the thesis will study Yarsagumba quantity and price mechanism, quality grading, and trend of Yarsagumba revenue collection in Dolpa district, share of revenue from Dolpa to the total revenue of Nepal, a general trade chain of Yarsagumba across different channels along with value additions in price of Yarsagumba trade.

Finally, there are a number of acts like Nepal's Forest Act 1993, Forest Regulations 1995 and enactment of Nepal Gazette 2016 are the main legislations to protect medicinal plants including Yarsagumba (Cordyceps sinensis). Despite this very little attention has been paid by the government to conserve and harvest Yarsagumba in a sustainable manner.

The Study is based upon the following research questions:

a) What is the present status of Yarsagumba collection in Dolpa District?
b) What is the contribution of Yarsagumba in income generation and expenditure of people in Dolpa District?
c) What is the trade chain mechanism of Yarsagumba?

1.3 Research Objectives

1.3.1 The General Objectives of the Study

The general objective of the study is to analyse the Yarsagumba collection and its contribution on Income and Expenditure in Dolpa district.

1.3.2 The Specific Objectives

However, its specific objectives are:

a) To analyse the present status of Yarsagumba collection in Dolpa District.
b) To examine contribution of Yarsagumba in income generation and expenditure of people in Dolpa district.
c) To identify the trade and trade chain of Yarsagumba in Dolpa District.

1.4 Significance of the Study

Yarsagumba harvesting is one of the key income sources for poor mountain communities in Nepal, where thousands of people are involved in harvesting and selling it. Lives of thousands of people of these communities have changed by involving in this occupation. Nepal produced nearly 3.0 tonnes Yarsagumba in 2015, where Dolpa ranked in the top position, contributing nearly 40 per cent of the country's supply, followed by Darchula and Jumla (DoF, 2011). Until date, the income from Yarsagumba accounted for up to 65.0 percent of the total household cash income, on average, and its contribution was highest in the poorest households (NRB, 2015). But these people are surrounded by bundles of problems, such as market problem, security problem in collecting Yarsagumba, loss of pasture, deforestation, dumping of solid waste in the pastures, and so on.

Government policy of Nepal regarding Yarsagumba has generally focused on charging tax. This has left out most poor mountain communities; moreover whose major sources of cash income is from Yarsagumba, where agricultural productivity is limited and there are few sources of livelihood opportunities. However, little or no attention has been paid by government for its proper management. Despite the fact that, the revenue contribution of Yarsagumba collection from Dolpa district is very significant compared to other districts and Yarsagumba found in Dolpa is the most qualitative one, a very limited study has been done on it till date.

In this regard, the significance of this study research is threefold; firstly, it aims enabling the people of the study area to know whether the share of Yarsagumba income is spent on productive or unproductive sectors. This will help them plan the household expenditure more responsively, as, there are very few researches which talk about the expenditure pattern of income generation from Yarsagumba and activities forgone due to Yarsagumba collection. Secondly, it aims providing the information regarding value trade chain across different channels from primary collector to the export in the international market, since, there are some studies conducted on Yarsagumba trade in Nepal. However, there are no any study that examines the trade value chain of Yarsagumba. Thirdly, it aims at categorizing the Yarsagumba under different grades along with its prices for the first time, which will help the government to make policies

that benefits the primary collectors and the nation as well. Overall, this study will help the academicians, researchers, policy makers, government and local people to understand the present status of Yarsagumba collection, income generation, and trade value chain in Nepal. It could act as key input especially for policy makers while developing new policies, plan and guidelines regarding natural resources management. It will further aware both the government and private sectors to work towards Yarsagumba processing and packaging before exporting to the international market.

1.5 Limitations of the Study

The possible limitations of the study are as follows:

a) The study is only limited to Jagadulla Gaunpalika and Tripurasundari Nagarpalika of Dolpa district. Hence, its findings may not be generalized to the whole Nation.
b) The study is limited to purposive sampling method which may limit the outcome of the research.
c) There is limited secondary literatures. So, the study is mostly based upon the perceptions of the respondents.
d) There is no comprehensive record of data regarding Yarsagumba collection.

1.6 Organization of the Study

The study report has been classified into five chapters. Basically, the first chapter comprises with the general introduction of the study which also contain the problems, significance, objectives, and limitations. The second chapter followed the current literature review of the related topic to find out the facts and figures. Likewise, the third chapter contains the methodologies that were used for the data collection and sampling size of the study area. However, in fourth chapter the data collected from the survey has been analysed and interpreted while the fifth chapter concludes with the summary, recommendation and conclusion derived from interpretation and analysis.

CHAPTER- II

LITERATURE REVIEW

2.1 Theoretical Review of Literature

2.1.1 Introduction of Yarsagumba

Yarsagumba is distributed in the alpine region of the Himalayas at the elevation of more than 4000m. It grows in Nepal, mainly found above the snowline in Dolpa, Jumla, Humla, Kalikot, Baglung, Mustang, Manang and Rasuwa districts of western and central Nepal. Also found in Countries such as Tibet, North-East India (Himachal Pradesh and Uttarakhand Himalayas), China and Bhutan. Yarsagumba has two components the lower part is dead caterpillar and the upper part is a fungus. The fungus has a small spike with dark brown fructification and yellowish white stalk. The size of the fungus is about 4 to 12 cm in length and 0.14 to 0.40 cm in girth. Yarsagumba with both the caterpillar and fungal part in an intact single piece is an item of commerce Gupta (2017).

Yarsagumba, also known as the 'Himalayan Gold' is renowned for its high valued medicinal herbs. It is found at high altitude between 3500m to 5500m above sea level. Basically, Himalayan regions of Nepal, Bhutan, India and Tibet are famous for Yarsagumba. The name Yarsagumba is originated from Tibetan language where `Yarsa` means `Summer grass` and `gunbu` means `winter insect'. The scientific name of this herb is Cordyceps sinensis (NRB, 2015).

For commercial purpose, Yarsagumba has the highest value than any other herbs. Medicinal plants are very important to human beings in preserving our health. To date, 25 percent of modern medicines are derived from plants that have been used by traditional medical practitioners. Yarsagumba being a very rare mushroom has a long history as a medicinal plant with diverse therapeutic applications, also used in many different countries. Moreover, it improves memory and keeps a person physically and mentally sound. For its medicinal effects, Yarsagumba has been an important component for a many of years in all over the world. However, due to a constantly growing demand and the difficulties in harvesting, Yarsagumba has become the most

expensive medicinal substance in the world. This powerful and natural fungal herb effectively prevents and treats a wide variety of diseases such as asthma, chronic bronchitis, tuberculosis, heart problems including cardiovascular disease and hypertension, kidney problems, acute and chronic hepatitis and tumors of many kinds (Gupta, 2017).

In Nepal, Yarsagumba collection has been taking place in almost 25 districts. Among them, the Yarsagumba found in Dolpa District is the most qualitative one (NRB, 2015). Similarly, the revenue contribution of Yarsagumba collection from Dolpa district is very significant compared to other districts. Almost 50 percent of the annual supply of Yarsagumba comes from Dolpa alone. Similarly, annually it contributes millions for governments' revenue (DoF, 2011).

2.1.2 History of Yarsagumba

Cordyceps was discovered about 1500 years ago in Tibet by herdsmen who observed that their livestock became energetic after eating a certain mushroom. About 1000 years later, the Emperor's physicians in the Ming Dynasty learned about this Tibetan wonder and used this knowledge with their own wisdom to develop powerful and potent medicine. Initial records of Cordyceps as medicine date from the Qing Dynasty in China in 1757 (Sharma, 2004). Its current high international profile and demand developed only sometime in 1993 when many Chinese long distance runners broke world records. There was the initial suspicion of the use of performance enhancing drugs but this was unfounded. The Chinese instead boasted of taking Cordyceps and it was then 'presented in the popular press as a 'wonder herbal', and the last ten years has seen an increase in its market' (Zhu et al., 1998).

In Tibetan, it is called Yarchakunbu, which literally means 'Yar' for rain; 'Cha' for plant; 'Kun' for winter; and 'Bu' for insect. So, the literal meaning of Yarchakunbu becomes summer plant winter insect. Tibetan people consider it as a 'Bu', which means living insect. In Buddhism, the collection of 'Bu' is considered as a sin act, which may be the reason of Yarsagumba being protected in the Himalayas for thousands of years. The botanical name of Yarsagumba comes from a latin word 'Cord 'and 'Ceps' which mean

club and head respectively. So, the meaning derived from its Latin name is an insect with its head in a horse's tail like body (Gupta, 2017).

2.1.3 Name in Other Languages

Table 2.1: Name Given To Yarsagumba in Different Languages

Different Languages	**Name**
English	Cordyceps mushroom, caterpillar fungus
Nepali	Yarsagumba, Jeebanbuti, Sanjivani, Kiraghas
Sanskrit	Sanjivani
Tibetan	Yarchagunbu
Japanese	Totsukasu, tochukasu
Chinese	Hiatsao tong tchon, dongchongxicao
Hindi	Keeraghas, keedajadi, keedaghas

Source: (Shrestha, 2013)

2.1.4 Status of Ophiocordyceps sinensis in International Context

Cannon, et al., (2009) studied that over the past 10 years its financial value has increased dramatically, with collectors paid as much as US$ 12,500 per kg for top quality material. This is causing significant distortion to local economies, and there is widespread concern that the current rate of collection is unsustainable. The study introduces the fungus and its hosts, documents some of the biological and social constraints to achieving the sustainability, describes the socioeconomic climate within which harvest and sale occurs in Bhutan and details the measures put in place by the Royal Government of Bhutan to promote wise management of this natural resource.

Tuli et. al., (2013) studied the broad spectrum potential of Cordyceps in including biological and pharmacological actions in immunological, hepatic, renal, cardiovascular systems as well as an anti-cancer agent. After the current efforts to delineate the mechanism of action of Cordyceps in various bio molecular processes. The study was certainly drawn attention of scientific community to improve the bioactivity and production of Cordyceps for its commercial use in pharmacological and medical fields.

Internationally, the health efficacies of Cordyceps sinensis are observed and tested in asthma, allergic rhinitis, poor renal function, renal injuries by chemicals chronic bronchitis, coughing, poor resistance of respiratory tract, regulating blood pressure (high or low blood pressure), anti-aging, weakness, the declining of sex drive, lowering raised blood lipid levels, strengthening the body's immunity, poor function of lungs and kidneys and in irregular menstruation (Zhu et al., 1998).

Winkler (2010a) found that the annual data is still not available for many areas of the Tibetan plateau in China as well as Himalayan production areas of India, Nepal, and Bhutan. Total production in the range of 85 to 185 tons for all production areas. Centuries of collection indicate that caterpillar fungus is a resilient resource. Still, unprecedented collection intensity, climate change and the recent economic dependence of local economies on caterpillar fungus call for sustainable resource management. The development of easily implementable approaches that can rely on community support will be crucial for successful management.

Weckerle, Yang, Huber, & Wang, (2010) studied the detailed analysis of Ophiocordyceps sinensis collection in a nature reserve in Southwest China. The study found that harvesting is unevenly distributed among households and villages, with households who have access to the resource but lack of adequate alternatives for income generation such as rewarding wage labour, fertile agricultural fields or harvest of other high value products being most involved. Although the collection is de jure forbidden, authorities of the nature reserve apply adaptive management strategies for sustainable resource use. This includes the allocation of collection areas to communities based on their traditional land use strategies and the control of harvesters from outside, triggering self-policing resource by the local people.

Winkler (2002) found that forests were traditionally regarded as a common asset by Tibetan communities and used primarily for construction timber and firewood, in addition to providing many non-timber forests products (NTFPs) such as medicinal plants and mushrooms. Traditionally, cash income has been generated through the collection and sale of medicinal plants. Traditional Chinese medicine (TCM) has been

the most important market for these products. These activity greatly expanded following economic reforms in China after 1981. NTFPs offer great potential for income generation in the Tibetan areas.

Rasul (2012) studied a medicinal and aromatic plants (MAPs) project was implemented in Nepal and parts of India from 2005 to 2009 by the International Centre of Integrated Mountain Development to enhance the livelihood options and reduce poverty of the poor rural households. The study found that MAPs and NTFPs were locally available and commercially valuable natural resources to improve the livelihoods of rural mountain people. The overwhelming majority of respondents (73%) reported that the higher prices obtained for MAPs and their products after project implementation were the main contributor to increase in their households' income.

Chakraborty, Chowdhury, & Nandi (2014) examined Cordyceps sinensis, popularly known as Yarsagumba, is a rare age old mushroom that has been valued extensively in traditional Chinese medicine. People of China and Tibet have been using this for various medicinal purposes since emperors' age. Its unique life cycle and diverse medicinal uses compelled science to show interest during last three decades. The present study reviews about its basic knowledge, claimed uses, their scientific backgrounds and its impact on socio- economic status. Much research work has been carried out leading to isolation of bioactive compounds and many of them undergoing clinical trials too. On the other hand, it shows immense effects on the lifestyle and economic status of inhabitants of those high altitude villages where it is found naturally. Despite of its scientific progress, further development is required particularly in formulation of dosage forms and analysis leading to the best utilization of this most costly medicinal mushroom.

2.1.5 Utilization of Yarsagumba

2.1.5.1 Utilization of Yarsagumba in International Context

Chakraborty, Chowdhury, & Nandi (2014) investigated the medicinal value of the Cordyceps species has been recognized since ancient times in China and the surrounding Orient. Traditionally it has been used as tonic and sexual stimulant for both sexes. For the same reason perhaps it has been named as "Himalayan herbal Viagra". It is used in case of sexual impotency. Other uses are in diarrhoea, headache, cough, rheumatism, asthma, allergic rhinitis, irregular menstruation and in liver diseases. People have their own knowledge for the use of this in different diseases. Chemical Constituents: Journey of Cordyceps sinensis has been started as a Traditional Chinese medicine in Tibet and China. With the advancement of time it spread to Nepal and other parts of the world. Science and technology helped it for more rationale use.

- Anti-tumour and anticancer activities: Investigations have proved that Cordyceps sinensis shows anti-tumour, free radical scavenging and anticancer effects.It has been suggested that polysaccharides of Cordyceps sinensis are may be responsible for these activity (Chakraborty et al., 2014).
- Immune modulator activities: Cordyceps sinensis shows both immunosuppressive and immuno-stimulating functions. It is observed that low-molecular weight part of extracts/fractions mainly shows such kind of effects.
- Effect on Hepatic cells: Effects of Cordyceps sinensis on various abnormal hepatic conditions have been demonstrated using different models. It also modulates the cellular immune function and increases the serum complement level in the patients with post-hepatitic cirrhosis. It also shows short-term curative effect in chronic hepatitis B (HBV).
- Effect on Cardiovascular system: Cordyceps sinensis shows prominent effects different conditions of cardiovascular system. Mycelia and fruiting bodies of Cordyceps sinensis are rich in adenosine and therefore mild hypotensive effect and platelet aggregation inhibition are observed (Chakraborty et al., 2014).
- Enhancement of physical stamina: The best-known medicinal action of Cordyceps is in the increase of physical stamina. In 1993, the Chinese National Games brought this mushroom to the attention of the world's sporting authorities. A group of nine women athletes who had been taking Cordyceps

shattered nine world records. There have been many reports of amazing improvements in performance in various sports due to the intake of Cordyceps.

- Aphrodisiac and sexual stimulant: Cordyceps species and, especially, Cordyceps sinensis have been appreciated for many centuries in Traditional Chinese Medicine (TCM) for its use as sexual stimulant and health promotion.

2.1.5.2 Utilization of Yarsagumba in Dolpa District

Cordyceps sinensis, a well-known and valued traditional medicine, is also called winter worm summer grass. The product deserves high potential to generate income opportunities, enhance rural income and raise the national revenue. Indigenous peoples are utilizing this Himalayan treasure for the treatment of different diseases like diarrhoea, headache, cough, rheumatism, liver disease, and also as an aphrodisiac and tonic. People in Dolpa call the high value medicinal herb Cordyceps sinensis as Yarsagumba, Jara (Root), Kira (Insect), Jeevan buti (Life tonic) Chyau (Mushrooms), and Chyau Kira (mushroom insect) etc. Dolpa district has been a famous ground of C. sinensis (Cordyceps sinensis) in the country since long time. Local respondents in Dolpa have reported that collection of C.sinensis started from 2044 BS (1987 AD).Internationally it is regarded as Himalayan Viagra (Devkota, 2006).

Recent research has revealed that Cordyceps usage increases both the cellular ATP (adenosine tri-phosphate) level and oxygen utilization. C. sinensis is consumed mixed with rice flour in boiled milk. Traditionally, it has been consumed with a variety of meats of chicken, duck and pork (depending on type of ailments) in the form of a medicinal soup (Zhu et al., 1998; Winkler, 2004). Local knowledge is interrelated with perceptions of many aspects of natural environment such as soil, climate, vegetation type, stages of ecological succession, and land use (Martin 1993, 1995). In some parts of Nepal, C. sinensis is powdered and combined with the rhizome of Dactylorhiza hatagirea for consumption (Adhikari, 2000). It is also used as tonic for yak and sheep. A combination is made with D. hatagirea (D. Don), honey and cow's milk for tonic and aphrodisiac (Lama et al., 2001). It is widely used as a tonic and aphrosidiac in Thak areas, Mustang. It is taken as a whole orally in combination with honey and cow's milk. (KC and Satyaal, 2006).

2.1.6 Yarsagumba Collection in Dolpa District

Devkota (2006) studied and found that local herders in the early years were the pioneers for their explorations. Formerly, they used to collect only the aerial part (fruiting body/ stroma) of C. sinensis and collected in the Doko (indigenous bamboo basket). They used to dry the product in the sunlight as primary processing. Local people believe that it gives good strength and hence they used to give it as gift to relatives and friends. People in Dolpa mostly involve themselves in agricultural activities; but in the season of Cordyceps sinensis collection they keep all other activities in secondary priority and actively involved in C. sinensis collection they earn money for their livelihood support. Local people, mostly indigenous communities, collect medicinal plants for trade and household consumption, for medicinal purpose. Traditional healers use different medicinal plants to cure different types of diseases. Local informants have said that barely 25 percent of total population including weak children, women and old people live in villages during the collection season of C. sinensis.

Different beliefs are expressed locally while directly seeing the live and fresh larvae that are actually the host of Cordyceps sinensis. Some collectors cover the larvae with some soil mass thinking that it will give birth to C. sinensis in the next year. Some believe that seeing the live caterpillar in the beginning of collection is good luck for prosperous life (Devkota, 2006).

Local and outside collectors in Dolpa district are aware of the uses of Cordyceps sinensis. They are using C. sinensis since last 20 years. Normally they used it as tonic and sexual stimulant for both sexes. Other local uses of C. sinensis are in diarrhoea, headache, cough, rheumatism and liver disease. People have their own knowledge for the use of C. sinensis in different diseases. Different doses of C. sinensis are used by its quality and also depending on the seriousness of the disease. As a tonic and for the purpose of sexual stimulant, people of both sexes normally use a daily combined dose of one dried C. sinensis with half litre of milk and two teaspoons of ghee for a week. Sometimes only a C. sinensis with a cup of milk is also used. Local users believed that if this practice is continued until recovery, every disease could be cured (Chhetri, 2014).

Its demand started going up rapidly after 1993 World Athletics Championship, during which Chinese athletes had set new world records. It is said these athletes were

consuming Yarsagumba as tonic, which enhanced their performance. Annual production of Yarsagumba worldwide stands at 83 to 183 tonnes and they yield $5 billion to $11 billion per year. Currently, China is the largest producer of Yarsagumba and meets 95 per cent of the world demand (Winkler, 2010).

Yarsagumba is collected at commercial level from 12 districts — Darchula, Dolpa, Jumla, Mugu, Bajhang, Rukum, Myagdi, Manang, Gorkha, Rasuwa, Sindhupalchowk and Sankhuwasabha. Yarsagumba was first collected in Nepal from Chakure Lek of Jumla in 1952. It's trading, however, began in late 1980s in Dolpa. At that time, price of each kg of Yarsagumba stood at Rs 700.

Dolpa district is famous for Yarsagumba collection in Nepal. People of Dolpa call the Cordyceps sinensis as Yarsagumba, Jara, Kira, Jeevan buti, Chyau, etc. The commercial collection of Yarsagumba started from 1987 A.D. (2044 BS). Local people use Yarsagumba believing in its strength. Gradually people from nearby districts came for Yarsagumba harvesting and then the commercial collection started. Currently, people from more than 20 districts come to collect Yarsagumba every year. The collectors within the buffer zone area has to pay Rs. 500, people of Dolpa district outside of the buffer zone area has to pay Rs. 2000 and people outside of the district has to pay Rs. 3000 as the collection permission charge.

2.1.6.1 Distribution and Ecology of Yarsagumba in Dolpa

Devkota (2006) studied the ecology and distribution of Yarsagumba in Dolpa district and found that Yarsagumba were actually found from 3540m to 5050m altitude. Moreover, the study has found high availability of Yarsagumba between the range of 4000m and 4900m altitudes.

There are more than 25 Yarsagumba pastures from where Yarsagumba is harvested. The Yarsagumba found in Naure Chitang pastures of Saldang is of good size and colour. However, Yarsagumba found in the Jagadulla pasture is good in terms of colour though of the smaller sizes. Local respondents have of the opinions that moderate and early snowfall is locally regarded as best for good emergence of Cordyceps sinensis.

2.1.6.2 Harvesting of Cordyceps from Dolpa

Majority of the people in Dolpa district are actively engaged in farming activities for meeting basic needs. Being involved in subsistence agriculture, NTFPs play an important role in rural community livelihood in the district. Besides fulfilling basic needs, forests and its product generate income and employment in rural community. Hence, the villagers mainly involve in Yarsagumba collection due to lack of alternative income sources and high demand in the international market.

Each year on average 50 thousand people go to different pastures (locally called as Patan) of Dolpa for Yarsagumba collection. Mostly collectors were from nearby districts like Jumla, Mugu, Kalikot, Jajarkot, Rukum, Rolpa, Mustang, Manang, Salyan, Pyuthan, Baglung. Additionally, people from other districts such as Surkhet, Ramechhap, Dhading, Dang, Bardiya, Nepalgunj, Okhaldhunga, Sindhupalchwok and Okhaldhunga come to collect Yarsagumba in Dolpa district. The peak harvesting seasons is mid-May to mid- July of every year. The collectors start the journey carrying huge loads on their backs or some use horses, Jhopas and mules to transport the goods and other basic needs to the collection area. But, Yarsagumba collection requires both intensive and extensive search as it is very hard to notice. The Yarsagumba is spotted with very close look. Mostly Yarsagumba collectors of the age between 20 to 40 years of age collects in the larger quantity because of their experience and knowledge about the caterpillar. On an average, a collector collects 10-50 Yarsagumba in a day. But, the Yarsagumba collection on an average has decresed in recent years due to increased number of Collectors and early collection by some people clandestinely. So, the average Yarsagumba collection per person has decreased drastically which can bring serious threat to the livelihood of the mountain people. Many people of the Dolpa district have neglected agriculture and livestock farming. The decrease in production of both agriculture and Yarsagumba can bring unexpected consequences in people`s lives and push many in the vicious circle of poverty.

2.1.6.3 Harvesting Methods

Every year more than 60 percent of total population of Dolpa district go in search of Yarsagumba. The Yarsagumba collection technique is similar in all parts of Nepal. Mainly collectors use Khurma (a small hoe), small kuto, sickle or small knife to lift the caterpillar fungus out of the soil. The common practices are uprooting, picking and gathering. This is needed to be done very carefully without breaking the fungal part. The collector usually use cotton bags or cotton clothes to store Yarsagumba.

2.1.6.4 Consumption of Yarsagumba in Dolpa District

Majority of people are aware that Yarsagumba has a very high medicinal value. They also are well-acquainted of the information that Yarsagumba is used to cure different diseases like diarrhoea, headache, cough, rheumatism and liver disease. However, majority of people in Dolpa district are the subsistence agriculturists. So, Yarsagumba income accounts the major share of the total cash income of the people in Dolpa district. So majority of people are actively involved in C. sinensis collection to earn money for their livelihood support. Local people, mostly indigenous communities, collect medicinal plants for trade and household consumption. Some Yarsagumba collector, mostly the rich traders in Dolpa take Yarsagumba flavoured items like Yarsagumba Raksi (local name for alcohol), or consume Yarsagumba combined with milk or honey. Some people take a crude form of Yarsagumba to know the real taste of the caterpillar. The local people are often using Yarsagumba to cure diseases like back pain, joint pain, gastritis, etc. Nowadays, many companies and pharmacy in the world are using Yarsagumba as powder and making capsule, tablet, and mixing in our hygienic food.

2.1.7 Yarsagumba Trade in Nepal

Devkota (2006) studied history of Yarsagumba collection and trade in Dolpa district. Local respondents in Dolpa reported that commercial collection of Yarsagumba started from 2044 BS. First commercial collection of Yarsagumba is perceived to be started from Kadatali of Majhphal VDC. Thereafter the collection practice expended to other VDCs such as Thargaun, Durgaun, Lara, Juphal, Suu, and Dunai. Initially, the local used to collect Yarsagumba in Doko (indigenous bamboo basket) and dry it on sunlight

as primary processing. Gradually, some people from Humla and Upper Dolpo came in search of Yarsagumba and their commercial harvesting started. Currently, people from more than 15 districts come yearly to Dolpa for Yarsagumba collection.

Although the caterpillar fungus has presumably been used in traditional Tibetan and Chinese medicine as a tonic and aphrodisiac and as relief medicine for lung, liver and kidney problems for centuries, it emerged as a significant market commodity only after economic liberalization in China in the 1980s (Winkler, 2010a).

Global trade rapidly expanded after the 1993 World Athletic Championships in Stuttgart, Germany, when Chinese athletes—reportedly training on dietary supplements of Ophiocordyceps and turtle blood—set multiple records in distance running (Winkler, 2010b). Today, it is the world's highest-priced biological commodity (Stone, 2008), more expensive by weight than gold. Best quality fungus in China fetched up to US $100,000 kg (Yuan 650 g) in March 2012, and in Singapore it reached US $130,000 kg at a time when the price of gold was about US $68,000 kg. On average, however, the retail price of the product ranges from US $45,000 to 90,000 kg (Shrestha, 2013). From 1997 to 2008, the market price climbed by 900 percent in Tibet (Winkler, 2010a), and from 2001 to 2011 by 2300 percent in Nepal. Exploding market demand and the dramatic price increases of the last 10 years may pose a serious threat to the existence of this species in its native habitat. There is widespread concern about the sustainability of the current harvest rates of this species (Cannon et al., 2009), but the quantitative trends in harvest, trade, supply and demand are not well known (Shrestha, 2013).

Dolpa district is regarded as a major warehouse of caterpillar fungus, contributing 40 percent of the total Nepalese supply in 2011. The caterpillar fungus of Dolpa is unusually large, has an attractive golden colour, and, therefore, commands a higher price from traders (personal observation). The fungus is collected from 24 pastures Dolpa district (DFO-Dolpa, 2010).

2.1.8 Policy Background

Cordyceps sinensis was legally protected and banned for collection, transport, trade and use in Nepal from 1996 to 2001. In the meantime, government realized the voices of stakeholders and lifted the ban but irrational royalty rate of Nepalese rupees (NRs.) 500 per piece was initially to discourage collection and trading of the species. In 2001, the government lifted the band on collection, trade and use but, controlled trade with the restriction over export of product and charging high royalty rate of NRs. 20,000 per kg, which encouraged local traders to smuggle via upper open boarder to Tibet (Devkota, 2006).

Nepal's Forest Act 1993 and Forest Regulations 1995 are the main legislations to protect medicinal plants including Yarsagumba (Cordyceps sinensis). For the last 25 years, people of Nepal recognized the commercial importance of such high value product Cordyceps sinensis (Devkota, 2008). Since then, it is used to be sold in the high price in voluminous amount by mountainous inhabitants‟ districts like Dolpa, Darchula and Jumla while the much collection mounted up from different districts. Even though the trade of Yarsagumba started in Dolpa district since 1988, Government of Nepal has legally banded the collection, transport, trade and used in Nepal until 2001 and imposed a penalty of NRs. 500 per piece to control its collection and trade. As processing was not clear, the government defined it as cleaning and steaming. In 2006, the legal provision of processing for export was removed and the high royalty rate was also reduced to NRs. 10,000 per kg. Nepal Gazette 2016 (GoN 2016) was enacted to allow users to collect Yarsagumba by paying NRP 25,000/kg.

Table 2.2: Legal Scenario for Yarsagumba Management

S.N.	Acts/Regulations/Policy	Legal Scenario
1.	Forest Act, 1993 (2049 BS)	Totally banned for collection, marketing and distributions, carriage and export
2.	Forest Regulation, 1995 (2051 BS)	Royalty/Penalty rate: NRs. 500 per piece
3.	Nepal Gazette2001 (2058/09/16 BS)	Could be traded abroad in processed from only on the approval of Department of forest Royalty rate: NRs. 20,000/kg
4.	Nepal Gazette, 2004 (2061/06/18 BS)	No requirements of processing for trade and transit Royalty rate: NRs. 20,000/kg
5.	Nepal Gazette, 2006 (2063/06/10 BS)	Royalty rate: NRs. 10,000/kg
6.	Nepal Gazette, 2016 (GoN, 2016)	Allows users to collect Yarsagumba by paying NRs 25,000/kg

Source: GoN, 2016

2.1.9 Sustainability

The World Conservation Strategy (IUCN et al. 1980) first highlighted the need for 'sustainable development', an approach to simultaneously address poverty, inequality, and environmental concerns (Hopwood et al. 2005). After the Brundtland Report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs", the concept has been thoroughly debated, refined, and appropriated by different interest groups to fit various agendas (Hopwood et al. 2005).

Rising commercial demand has spurred a sharp increase of collecting and, consequently, concerns over the sustainability of the Yarsagumba harvest (Sharma 2004; Cannon et al. 2009; Winkler 2010a; Weckerle et al. 2010; Shrestha and Bawa 2013). Although insufficient data exists to track long-term trends with certainty (Winkler 2010a), one study in Dolpa, Nepal, indicates a recent decline in the volume of yartsa gunbu gathered and a local perception that current collection practices are unsustainable (Shrestha and Bawa 2013). Importantly, Dolpa allows outsiders access

to collection grounds. Several scholars argue that community-based management practices can be effective mechanisms to ensure sustainability (Cannon et al. 2009; Weckerle et al. 2010; Shrestha and Bawa 2013).

(Zhang et al. 2009) researched study found that the collection of Cordyceps sinensis has been started for centuries. In recent years the issue of sustainability at current harvest has been raised cautiously. At the present, an assessment on sustainability at current harvesting levels is not feasible because of the meagre research and the baseline data is missing as with, most wild mushrooms. In addition, annual fluctuations are very common as with all mushroom fruiting, thus further complicating the interpretation of available data. However, a clear trend towards increased harvesting pressure is recognizable over its entire distribution, which is further escalating with increased prices.

Recognized for its medicinal value, O. Cordyceps trade has become one of the major income sources for mountain communities. This has led to overharvesting and related environmental degradation in its habitat. Although national governments are making efforts to introduce better harvesting and management practices, policies and regulations for collection and trade of Cordyceps differ from country to country. Therefore, the government institutions as well as the communities have a great interest to work on national policies as well as on the local level management plans to reduce the negative impacts of Cordyceps collection and trade.

Winkler (2004) investigated that the Pastoralists in many areas are often heard of complaining about the destruction of host grasslands by diggers of Cordyceps, who make unnecessarily bigger holes in the turf and expose the soil after removal of the fungus. Such careless extraction, often marked as Yarsagumba poaching, not only degrades pastures quality, but also disturbs the habitat of the Thitarodes (Hepialus) moths thereby potentially undermining the resource sustainability. A healthy grassland environment is favourable for the larvae development.

Devkota (2006) identified that the long-term impact of Yarsagumba collection on its reproduction is still unknown. From mycological point of view, it can be speculated that if the fungus is collected after it had sufficient time to release enough spores, there

might not be any negative impact. The study reveals that due to reduction of Cordyceps may negatively impact the ecological balance of the grasslands, since the larvae feeds on the root of the forage grasses.

2.2 Empirical Literature Review

Shrestha (2013) investigated the impacts of trade on natural populations of the world`s most expensive biological resource, a unique caterpillar fungus (Ophiocordyceps sinensis). The main objective of the study is to quantify trends in harvest, trade, supply and demand over last 5 years in Nepal Himalayas, and document the harvester's perceptions on collection modes, resource abundance and reason for decline in caterpillar collection. The field survey was conducted selecting samples randomly without replacement using lottery method. The information collected from focused group discussions and key informant interview to validate the information. The data were analysed using linear regression to observe harvest trend of per capita. From Dolpa district 3.1 kg was marketed in 2002, trade volume peaked at 872.4 kg in 2009 and then declined continuously to 473.8 kg in 2009. Dolpa harvesters sold fungus for NRs 20-25 per piece, but they received NRs 200-600 per piece in 2011, representing the increase of 900-2300 percent. Similarly, local traders sold to exporter for NRs 80,000-130,000/kg in 2001 to NRs 1,100,000-1,600,000/kg in 2011-an increase of 1131-1275 percent. The annual harvest per person ranged between 48 and 427 pieces (mean 260.66$\pm$ 212.21, n=167) in 2006; in 2010 it sank between 28 and 23 pieces (mean 125.82± 96.84, n=197). The average decline was thus 32.58 (SE=3.70, $p<0.0001$) pieces per harvester per year during the last 5 years. Similarly, the average daily collection per person decreased by 3.14 (SE=0.32, $p<0.0001$) per year during the same period. By contrast, the average number of collection days increased from 16.87± 10.89 in 2006 to 20.76± 10.34 in 2010, a day (0.97) person per year (SE=0.25, $p<0.001$). Therefore trade volume increased significantly and local market price has increased up to 2300 percent over the last 10 years. However, mean annual harvest declined from 2006 to 2010.

Mukhiya & Rai (2012) reviewed a study entitled Ophiocordyceps sinensis a significant nature gift to livelihood of high mountain people of Bhutan Himalaya. The main objective of the study was to understand how much the O. sinensis contribute to

economy of highland people of Bhutan and know the variations in annual production of O. sinensis in the Himalayan region of Bhutan. A total of nine years data was collected (2004-2012) for analysis of the product harvested. Both primary and secondary data were extensively collected ascertain the appropriate information. To analyse the data, SPSS, MS-excel, one way ANOVA along with post hoc tests for multiple comparisons and non-parametric Mann-Whitney U-test were employed (which shows the ranking and significance of the selected variables at 0.05 and 0.001 levels). There was a significance of difference on production of O. sinensis between and within the growing regions as it showed $F = 7.088$ at level $p<.05$. The total income generated was also significant to the regions, $F (2, 46) = 5.460$, $p = .007$. The post hoc test like Bonferroni for multiple comparisons also deduced that all variables taken for test was highly significant at the 0.05 level, p=0.002, 0.040 and 0.007 respectively. This result clearly shows that O. sinensis is very significant to the nomad people's livelihood and even to Royal Government since it contributes a lot amount as royalty. The yield pattern of this product is difficult to understand as it tends to show inconsistent production level. However, most of the year it showed an increased in yield if it is sum for the country. Thus consistence, extensive and long term research is necessary in in-situ state so that its biological and production characters are understood.

Choedup (2014) examined the study entitled indigineous management strategies and socioeconomic impacts of Yartsa Gunbu (Ophiocordyceps sinensis) harvesting in Nubri and Tsum, Nepal. So, this study seeks to partially fill that research void through a case study of the Yartsa gunbu harvest in Nubri and Tsum, contiguous valleys in Nepal inhabited by ethnic Tibetans. Using data from household surveys and in-depth interviews, the authors describe the process of gathering and selling Yartsa gunbu within the parameters of management practices that combine religious and secular regulations over natural resources. The authors conclude with a discussion of the indigenous management system in relation to sustainable development. The economic data presented in this paper comes from the 2012 Household Survey of Nubri, Tsum and Mustang conducted by Cynthia Beall, Geoff Childs, and Sienna Craig. The study gathered demographic information on every individual in the stud area, and economic information on every household including how much money they had made from the previous Yartsa Gunbu harvest. The first-hand information at the primary harvesting sites were also gathered by spending time in Yartsa Gunbu camps. Most people use

their income, which ranged from NRs. 2,000-NRs 300,000 in 2011 (USD 24-USD 3530) to buy food and clothing from markets in China. Each household, must register its collectors with the village administration and pay Yartsa Gunbu tax of NRs 100 (USD 1.20) for the first household member and NRs 4,500 (USD 53) for each additional member. The money is spent on common purpose, inviting a lama to perform rituals, repairing the hydroelectricity system, and to guard against outside poachers, the village pays a few men a daily salary to guard the richest harvesting grounds. The average earning of per household by soutce and village could be shown as follows.

Table 2.3: Average Income per Household by Source and Village.

VDC (Valley)	Yarsagumba Income	Total Income (Includes remittance)	Total Income percent from Yarsagumba
Lho (Nubri)	NRs 12,800 ($151)	NRs 13,900 ($164)	92.1%
Chhekampar (Tsum)	NRs 40,900 ($481)	NRs 49,300 ($580)	83.0%
Samagaun (Nubri)	NRs 69,400 ($816)	NRs 90,200 ($1,061)	76.9%

Source: (Choedup, 2014)

Table 2.3 demonstrates that Yartsa gunbu provides the majority of income for the residents of the three Village Development Committees (VDCs) where Yartsa gunbu is found, but also shows considerable variation. Samagaun has the most abundant highland pastures and therefore profits the most from the harvest.

The research study show that internationally, the health efficacies of Yarsagumba are observed and hence, it is regarded as high valued medicinal herb. Therefore, its demand and price exploded in the international market. As a result, commercial harvesting of Yarsagumba started which helped generating alternative source of cash income for people and revenue to the government. So, the naturally available and commercially valuable Yarsagumba has significant contribution to both the rural and national economy.

CHAPTER-III

RESEARCH METHODOLOGY

3.1 Research Design

The study is focused on the Yarsagumba collection in Dolpa district. It analyses the impact of Yarsagumba on Jagadulla Gaunpalika and Tripura Sundari Nagarpalika of Dolpa district and on the Nepalese economy as well. This study is exploratory as well as descriptive in nature. Exploratory methods focused on with why questions and, the descriptive methods focused on the collection of wide range of socio economic information. Both qualitative and quantitative data are collected to fulfil the research objectives.

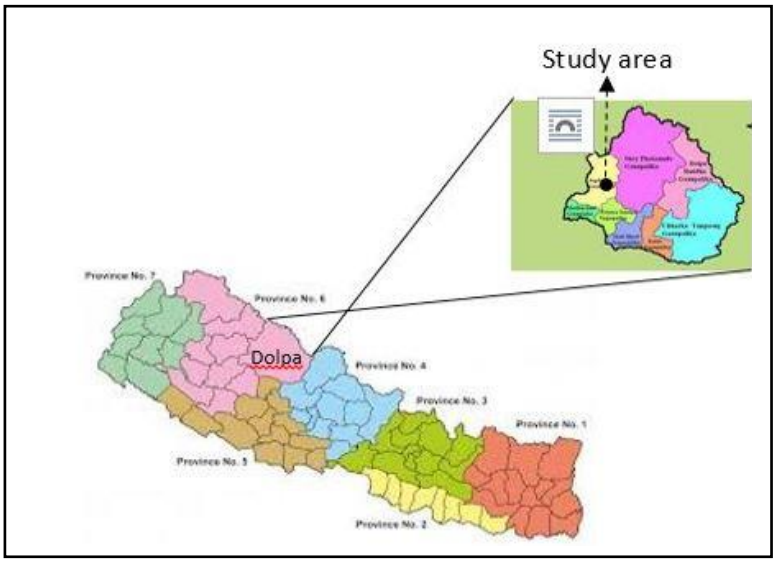
Both primary and secondary sources were used for information collection. The collection and marketing of Yarsagumba started since a few years back. The research was focused on understanding the impact of Yarsagumba on the livelihood of the people in the study area.

The information essential for the research were the current status of Yarsagumba collection and marketing, its impact on the economy, socioeconomic impact on education, health, employment, income, peace and security, Yarsagumba trade chain, major problems and challenges of Yarsagumba collection. Hence, the study also utilized data collected from the relevant literatures and opinions of the concerned stakeholders. Similarly, the research is more of an exploratory in nature.

3.2 Study Area

The study has been conducted in Jagadulla Gaunpalika and Tripura Sundari municipality of Dolpa District. The geographical position of the district is between $28^0$24`N to $28^0$43`N latitude and $82^0$24`E to $83^0$38`E longitudes (Chhetri and Gotame, 2010). The Jagadulla Gaupalika was formed by merging two former Village Development Committee (VDCs) namely Rimi and Kaigaun. The Tripura Sundari municipality comprises of 5 former VDCs namely Tripurakot, Shu, Lha, Pahada and Liku. There are 8 rural municipalities in Dolpa district. Dolpa Districts has the

population of 36,700 which 0.14 percent of the national population among which 49.69 percent Male and 50.31 percent Female.



Dolpa district is regarded as a major warehouse of caterpillar fungus, contributing to 40 percent of the national supply in 2011. The caterpillar fungus of Dolpa district is unusually large and, has an attractive golden colour and, therefore commands a higher price from traders (Shrestha, 2012). The study area was chosen in such a way that it encompasses one rural village municipality and one municipality. The both the study areas are fertile for the production of Yarsagumba. The fungus is collected from more than 24 pastures in Dolpa district (DFO-Dolpa, 2010).

As per the recent federal structure, there are 6 wards in Jagadulla gaunpalika and 11 wards in Tripura Sundari Nagarpalika. Ten percent of households from these two municipalities were determined as the sample. So, 62 and 230 households sample were taken in total from Jagadulla Gaunpalika and Tripura Sundari Nagarpalika respectively.

3.3 Sample Size and Sampling Procedure

The study basically concentrated in the Tripura Sundari Nagarpalika and Jagadulla Gaunpalika of Dolpa district. The sampling method was done randomly as well and purposively as the sampling procedures were followed as the following.

1. For the purpose of sample size determination, the 230 households from all 11 wards of Tripura Sundari Nagarpalika and 62 households from all 6 wards of Jagadulla Gaunpalika were randomly selected and the study sites were stratified into site1 and site2 for the study.

Site 1 (S_1) : Tripura Sundari Nagarpalika

Site 2 (S_2) : Jagadulla Gaunpalika

2. Based on the population assumed of each of the Nagarpalika and Gaunpalika above, the proportion of sample size was determined. Total sample size thus was determined at 292 households as the following.

Table 3.1: Households and Sample Selection from Each Wards.

	Ward No.	Total Households	Sample size (HHs) (10% of HHs)
Tripura Sundari Nagarpalika (S_1)	1	292	30
	2	325	33
	3	210	21
	4	190	19
	5	130	13
	6	90	9
	7	277	28
	8	215	22
	9	173	18
	10	152	16
	11	203	21
Total (A)		**2257**	**230**

	Ward No.	Total Households	Sample size (HHs) (10% of HHs)
Jagadulla Gaunpalika (S_2)	1	60	6
	2	55	6
	3	160	16
	4	110	11
	5	80	8
	6	150	15
Total (B)		**615**	**62**
Grand Total (A+B)		**2872**	**292**

Source: [1]Field Survey, October/November, 2017

[2]VDC Profile

3. Due consideration was taken in identifying the Yarsagumba collecting households, women, Dalit and indigenous janajati and mountain janajati with subsistence farming and traders with commercial Yarsagumba sellers etc.

4. In each ward of Municipality and Rural Municipality, the study is conducted only with the Yarsagumba collecting member of the family. The first respondent in each ward is chosen as a random sample and thereafter, the snowball sampling technique is used to interview other respondents until the number of respondents to be interviewed is reached. Similar procedure was adopted in all 17 wards. The method of data collection is employed so as to meet a respondents who could provide a complete information to fulfil the research objectives.

3.4 Nature and Sources of Data Collection

This study is based on both the primary and secondary data which are qualitative as well as quantitative in nature. Primary data has been generated using Semi-structured questionnaire household survey Focused Group Discussion, Key Informants Surveys and Close Observation.

3.4.1 Secondary Data Collection

Secondary data has been collected from both published and unpublished reports and journals from research institutes. Chief sources are Nepal Living Standard Survey, Economic Survey, and Statistical year book of Nepal, various publications of the Nepal Rastra Bank, unpublished dissertations, previous studies, articles and daily newspapers. Some other important information has been collected from the related website.

3.4.2 Primary Data Collection

The primary information for this study was the first hand information generated directly from the respondent households at their homestead. The sources of primary information were;

(a) Household Surveys

Household survey for this study was the series of interviews with the individual sample respondents at their place with the help of a well-structured questionnaire (Annex -1) designed based on the problems and corresponding objectives. During interview, questions were asked and possible multiple responses were sought to make the analysis more effective and to bring into reality. The use of primary information of household survey was of high importance to establish the data more reliable and authentic for discussion of the study. A total of 292 households were randomly and purposively selected and visited for interview.

(b) Interview with Key Informants

Some of the information was found to be important to be administered only with the key informants (KI) and, for this study the district level traders, national park chief officer, District Forest Office (DFO) chief officer and local newspaper journalist were identified as the key informants. Purpose of visiting the key informants were to gather a series of logical, accurate and reliable information in short period of time to the present status of Yarsagumba, it trade chain and conservation strategies adopted for its sustainable harvesting. Key informant interviews were conducted with 10 local and 5 district level traders with well-structured questionnaire (Annex -2). Additionally, Chief Ranger Officer at Sheyphoksundo National Park and DFO chief of Dolpa district were also interviewed in their respective offices. Facts obtained from the key informants were so important in justifying the findings derived from primary sources.

(c) Focused Group Discussions

The group taken for the focus group discussions (FGD) was composed of 6-8 persons. Both male and female participants Yarsagumba traders, indigenous people, Dalit, youth were involved in FGD. The groups from each sample rural municipality/municipality were taken as FGD and conducted at evening. A brief check list was prepared to administer the FGD in which the discussions were focused in area current trend of Yarsagumba collection, its conservation issues, and uses of Yarsagumba income, market value and its management. Information

generated from the FGD was considerably supplemented to verify the relevant of information obtained from other sources.

(d) Close Observations

The location S_1 and S_2 were closely observed during the field study. Buildings structures, close observations of personal accessories and assets, small business enterprise and educational access of their children.

3.5 Data Edit, Analysis and Presentation

The first hand data collection from the field was followed through different phases before analysis. Firstly, filtering and sorting for selecting the necessary information and removing the unnecessary information. Secondly, data entry in MS-Excel software. In this case, Excel was used for the data entry and analysis. Lastly, all the information in the software were coded with specific codes to derive the desired information during the analysis phase.

The data are analysed with the help of using Excel to derive the desired statistical values for the statistical analysis to support the stated objectives of the study. All the information are coded, entered and tabulated. To make the findings more clear and conspicuous to the reader different graphs, charts and diagrams are prepared.

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CHAPTER- IV

PRESENTATION AND ANALYSIS OF DATA

4.1 General Information of the Respondents

Dolpa is rich in natural resources like rich biodiversity, valuable herbs like Yarsagumba. Yarsagumba trade was started in 1980s from Dolpa district. Dolpa, a virgin territory for researchers offers endless opportunities for study a about variety of topics. Various study shows that the Yarsagumba found in Dolpa District is the most qualitative one. Similarly, according to DoF, the revenue contribution of Yarsagumba collection from Dolpa district is very significant compared to other districts.

Every year thousands of people go for the Yarsagumba collection in Dolpa district. So, in order to analyse the socio economic contribution of Yarsagumba in Dolpa district it is very essential to know about the general background of the Yarsagumba collectors.

The study shows that large group of people can be seen climbing higher up the snow-capped Himalayas, carrying blankets, tents and cooking materials. When the annual Yarsagumba harvesting season hits, all available hands and eyes become engaged in the lucrative hunt.

Livelihood of mountain people largely depends on the collection and trade of Yarsagmba. Yarsagumba is highly valued medicinal plant which immensely contribute in the income generation of the mountain people. The contribution of Yarsagumba income is the second largest contributor to the total household income which accounts for 74 percent contribution to the total cash income.

The field survey conducted gives the following background information of the respondents.

Table 4.1: Characteristics of Respondents

Characteristics		Percentage (%)
Total Households in study area	N=2867	
Sample Households (HHs)	n =292	
Sample Size (%)		10.2
Gender Distribution (%)	Male	70.9
	Female	29.1
Literacy (%)	Illiterate	21.9
	Just literate	47.6
	Secondary Level	24.0
	Higher Level	6.5
Occupation (%)	Agriculture	45.9
	Livestock Farming	29.1
	Business	19.5
	Services	5.5
Caste/Ethnicity (%)	Brahmin/Chhetri/Thakuri	48.0
	Ghale/Gurung/Magar/Tamang	22.9
	Damai/Kami/Sarki	20.5
	Bhote/Sherpa/Thakali	8.6

Source: Field Survey, October/November, 2017

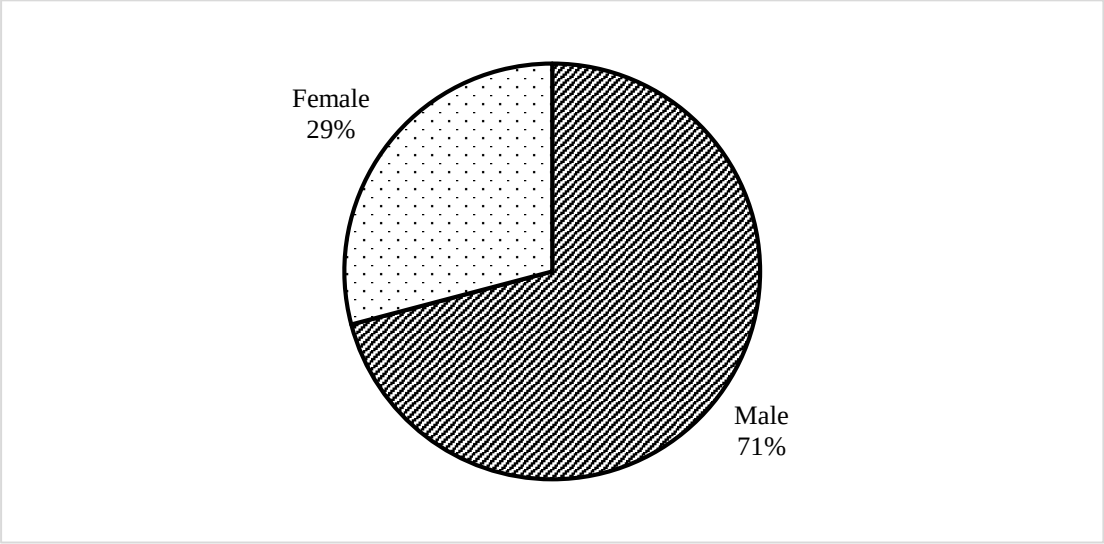
The table 4.1 shows that 292 (10% of total HHs) sample households were interviewed from 17 wards of the study area. The survey data shows that the average family size of each households is 5.3. The table shows the general characteristics of the respondents such as age, gender, age group, major occupations, caste /ethnicity and food sufficiency level. The data from above table can be explained in detail under the following headings.

4.1.1 Gender of Distribution of Respondents

The survey shows that 70.9 percent respondents were males and 29.1 percent were females. It is known that majority of households in the study area are engaged in subsistence farming. So, during Yarsagumba collection more stay behind to look after the households' activities, agriculture, livestock and children.

It can be further illustrated by the following graph.

Figure 4.1: Gender Distribution of Respondents



Source: Field Survey, October/November, 2017

The figure 4.1 shows that majority of respondents are men because women look after agriculture, children and other household activities.

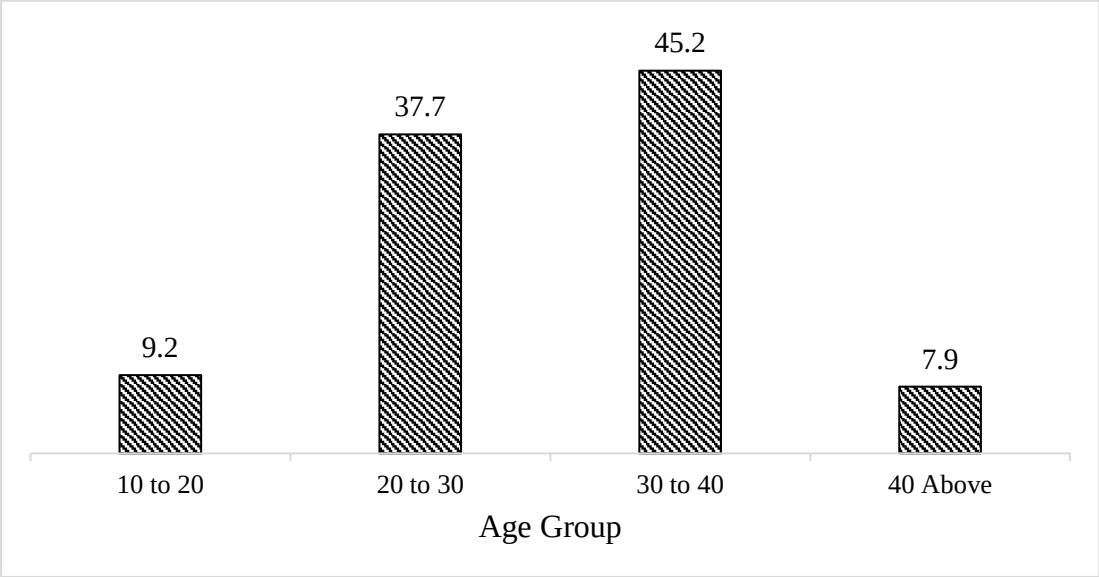
4.1.2 Age of the Respondents

The study was carried out in Jagadulla Gaunpalika and Tripurasundari Nagarpalika of Dolpa district. The study area is composed of both active and inactive age grup population. Mostly, the people of age between 25 to 35 are involved in Yarsagumba collection. In recent years, students are discouraged to go for Yarsagumba collection. The household survey was conducted at household level with both randomly and purposively selected 292 respondents.

Every year thousands of people from Jagadulla Rural Municipality and Tripurasundari Municipality go to harvest Yarsagumba in more than 24 pastures of Dolpa district. It is observed that people of ages between 10 to 20 and 40 and above are least involved in Yarsagumba collection.

This can be explained with the following bar diagram.

Figure 4.2: Age of the Respondents



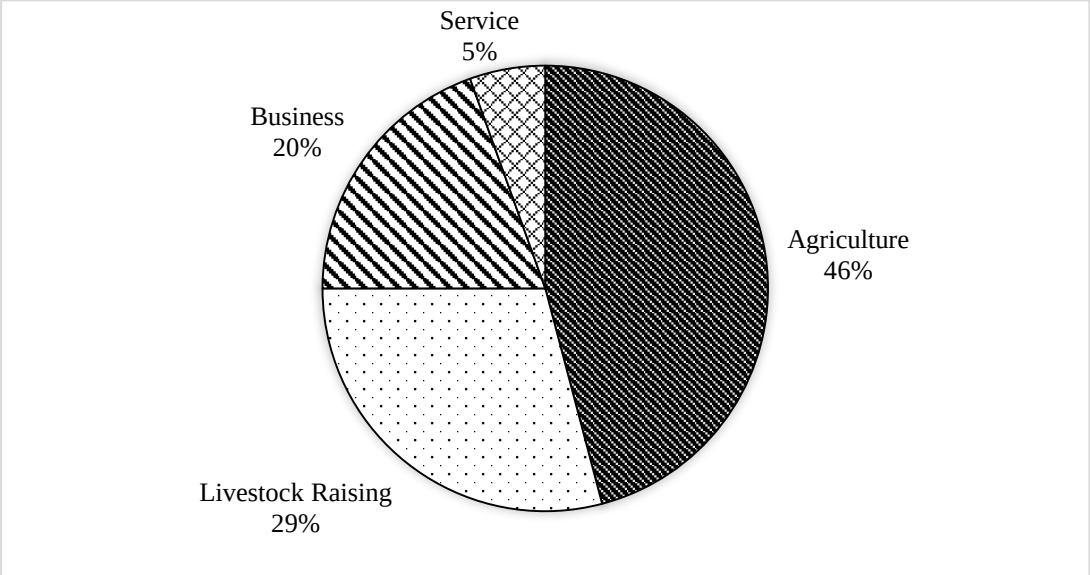
Source: Field Survey, October/November, 2017

The figure 4.2 shows that almost 37.7 percent respondents are of the age group 20 to 30 and 45.2 percent respondents are of the age group 30 to 40 years of age. So, majority of Yarsagumba collectors are of the age between 20 to 40 years of age. The collector of these age groups are more active and have enough knowledge on Yarsagumba collection and its pastures.

4.1.3 Major Occupation of the Respondents

Agriculture is the major occupation of the people in the study area. Besides agriculture livestock farming is another occupation, raising sheep, cows' horses, Jhopas, mules, etc. But gradually people are leaving agriculture and livestock farming and turning towards Business, foreign labour migration, Yarsagumba collection. This has reduced the agricultural productivity which in turn has increased the dependency on Yarsagumba which has serious consequences in near future. The major occupation of the respondents can be explained with the following pie chart.

Figure 4.3: Major Occupation of Respondents



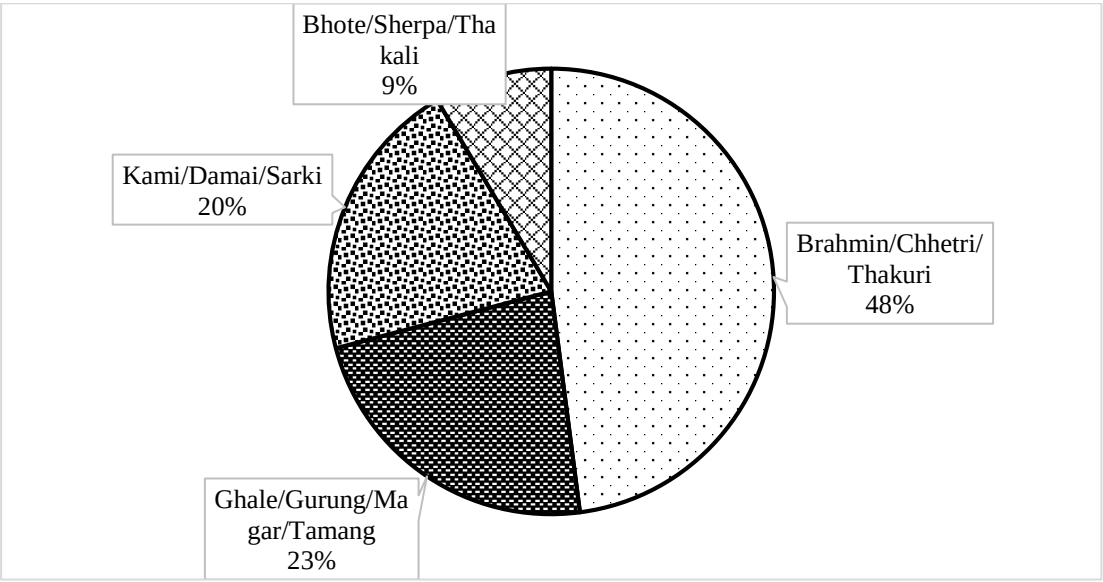
Source: Field Survey, October/November, 2017

The figure 4.3 shows that about 46 percent of population are engaged in agriculture, 29 percent in livestock raising, 20 percent in small business enterprises, and 5 percent in service sector. This illustrates that very few people are in service sector. Furthermore, the study shows that in recent year's people have started small business enterprises like hotel, teashops, clothing stores, groceries, etc. So, Yarsagumba is the main source of cash income to the people of the study area.

4.1.4 Caste/Ethnicity of Respondents

The people of all caste and ethnic background go for the Yarsagumba collection in Dolpa district. The study area comprises of Brahmin, Chhetri, Thakuri, Ghale, Gurung, Magar, Tamang, Damai, Kami, Sarki, Bhote, Sherpa and Thakali. It can be further illustrated with the following figure.

Figure 4.4: Caste/Ethnicity of Respondents



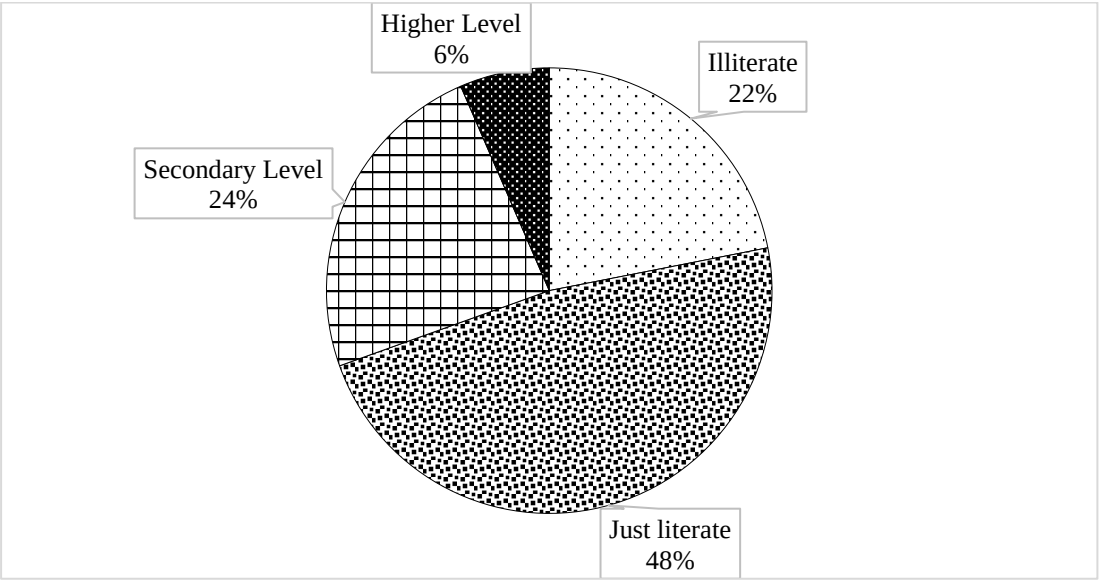
Source: Field Survey, October/November, 2017

The figure 4.4 shows that 48 percent respondents are from Bahun/ Chhetri/ Thakuri, 23 percent are Ghale/ Gurung/ Magar/ Tamang, 20 percent are Damai/ Kami/ Sarki and 9 percent are Bhote/ Sherpa/ Thakali. The majority of Yarsagumba collectors are subsistence agriculturists are poor due to which they harvest Yarsagumba to support their basic needs.

4.1.5 Education Level of Respondents

As agriculture and animal husbandry do not suffice in to sustain people lives, the inhabitants rely on Yarsagumba collection to get access to basic goods. The study shows that 47.6 percent respondents are just literate and 21.9 percent are illiterate.

Figure 4.5: Education Level of Respondents



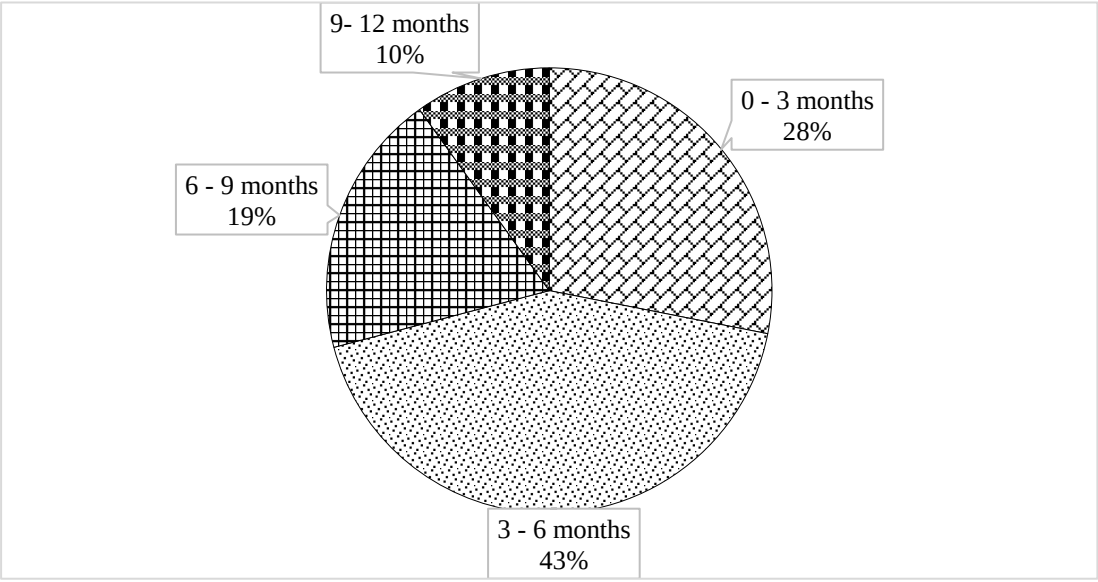
Source: Field Survey, October/November, 2017

The figure 4.5 shows that 22 percent respondents are illiterate, 48 percent are just literate, 24 percent have secondary level education and 6 percent have higher level education.

4.1.6 Food Sufficiency Level of the Respondents

Every year more thousands of people go for Yarsagumba collection in more than 24 pastures of Dolpa district. Though majority of people are subsistence agriculturists, the food sufficiency level of 71 percent respondents are less than 6 months. This is the serious indication of food scarcity among the mountain people. Hence, the study shows that Yarsagumba income is pivotal for sustaining the livelihoods of mountain people. The study shows that Yarsagumba income is the second highest contributor to the total annual income of the people and highest contributor of cash income to the people. So, Yarsagumba income has contributed in reducing poverty and allowed poor families to send their children to school and pay off debt.

Figure 4.6: Food Sufficiency Level of the Respondents



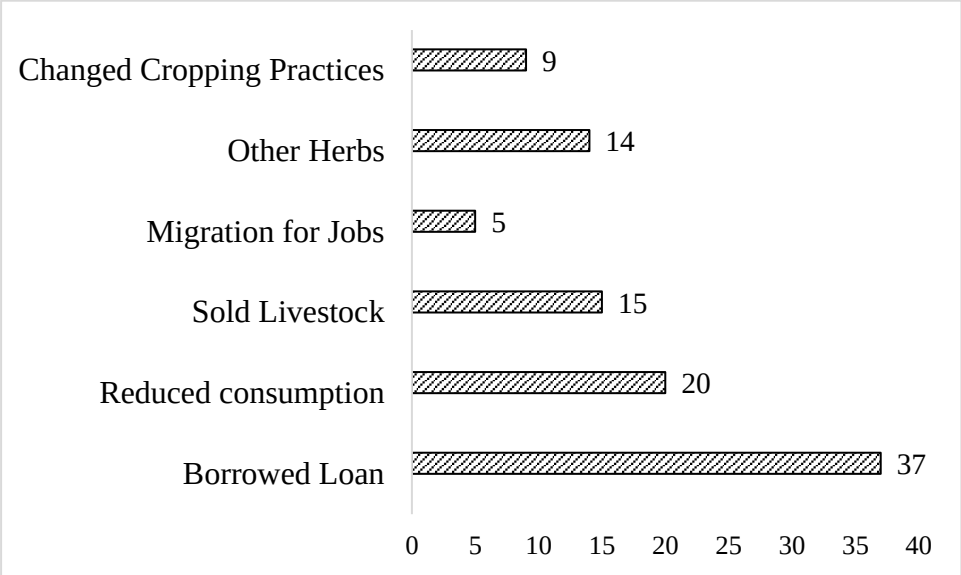
Source: Field Survey, October/November, 2017

The figure 4.6 shows that 28 percent respondents have food sufficiency between 0 to 3 months, 43 percent have food sufficiency between 3 to 6 months, 19 percent have food sufficiency between 6 to 9 months and 10 percent respondents have food sufficiency between 9 to 12 months. The graph clearly depicts that about 71 percent respondents have food sufficiency level less than 6 months. Hence, income from Yarsagumba collection provided the major alternative income source to the poor families.

4.1.7 Coping Mechanisms and Adaptive Strategies

There are two kinds of responses to crisis, mainly resulting from food insufficiency and hunger they are coping mechanisms and adaptive strategies. Coping mechanisms are the actual responses to crisis on livelihood systems in the face of unwelcome situations, and are considered as short-term responses (Berkes & Jolly 2001). Adaptive strategies are the strategies in which a region or a sector responds to changes in their livelihood through either autonomous or planned adaptation. The coping mechanisms and adaptive strategies for the respondents in the study area were found that many households chose for migration to meet the deficit income in their family while others choses for use of inter-household transfers and loans, reduction of consumption levels, selling livestock, sale of possessions (e.g., jewellery), changes in cropping and planting practices, sale or mortgaging of land or the mix of any of these activities.

Figure 4.7: Coping Mechanisms and Adaptive Strategies



Source: Field Survey, October/November 2017

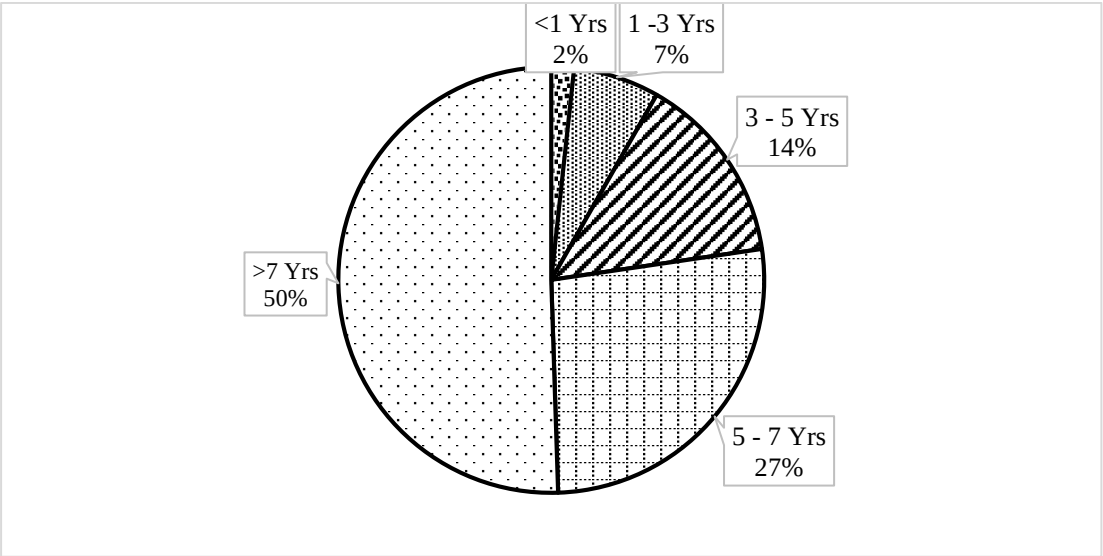
The figure 4.7 shows 37 percent respondents shared borrowing loan as their coping mechanism of food deficiency, 20 percent reduced consumption level, 15 percent sold their livestock to meet their food deficiency level, 14 percent harvested and sold other herbs, 5 percent went for search of jobs and 9 percent changed their cropping practices as adaptive strategy to meet their food deficiency.

4.2 Status of Yarsagumba Collection

Dolpa district is famous for Yarsagumba collection in both in terms of quantity and quality. Every year thousands of people go in search of Yarsagumba collection. But, over the last three years Yarsagumba collection has decreased. But the number of collectors are increasing every year due to high demand for the caterpillar in the international market (DFO-Dolpa, 2012). The present status of Yarsagumba collection can be explained under the following headings.

4.2.1 Number of Years Involvement in Yarsagumba Collection

Figure 4.8: Number of Years Involvement in Yarsagumba Collection



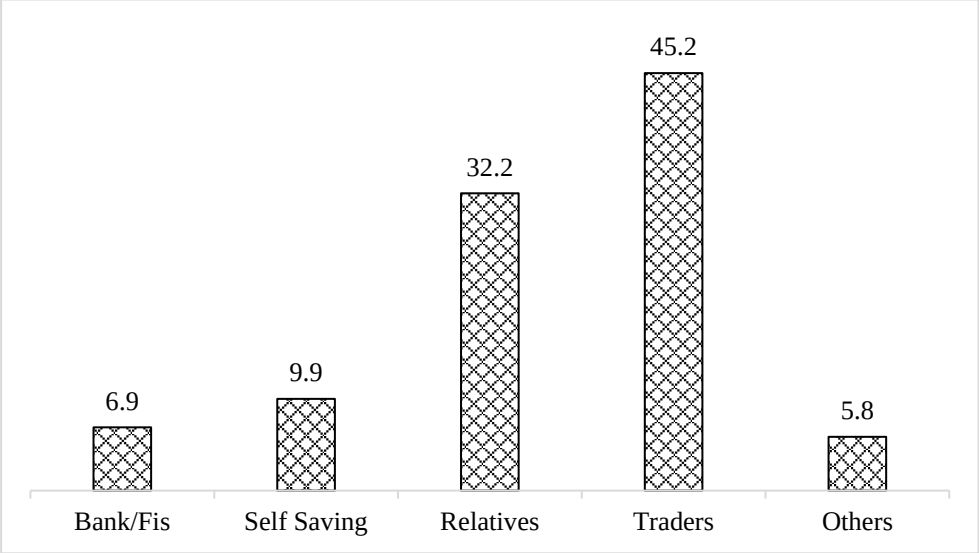
Source: Field Survey, October/November, 2017

The figure 4.8 shows that 50 percent of respondents have been involved in Yarsagumba collection for more than 7 years, 27 percent for 5 to 7 years, 14 percent for 3 to 5 years, 7 percent for 1 to 3 years and 2 percent for just a year. The majority of the respondents who were involved in Yarsagumba were subsistence agriculturist who have food sufficiency for less than 6 months and are economically poor households.

4.2.2 Financing Sources for Yarsagumba Collection

A Yarsagumba collector needs money for purchasing different things such as tents, food items, clothes and other equipment for Yarsagumba harvesting. The study shows that major source of finance were traders and relatives.

Figure 4.9: Source of Finance Yarsagumba Collection



Source: Field Survey, October/November, 2017

The figure 4.9 shows that traders accounts (45.2%), relatives (32.2%), self-savings (9.9%), Bank/FIs (6.9%) and others (5.8%). So, majority of poor collector take loan mainly from traders and relatives during the festivals and to buy food items. They collect Yarsagumba in the following year and give Yarsagumba to the lenders. As there is decreasing trend of Yarsagumba in recent years, many collectors are unable to harvest enough Yarsagumba to pay off debt. This has adversely affected the livelihood of the mountain people.

The study shows that, on an average 2-3 members from each household go for harvesting Yarsagumba. In recent years, the number of people going for Yarsagumba collection in the study area is gradually declining as less number of Yarsagumba is found. The field study findings shows that each household collect 500 pieces of Yarsagumba on an average.

4.2.3 Expenditure Incurred on Yarsagumba Collection

There are various cost associated with Yarsagumba collection like permission charge, food items, clothing items, tents, medicine and other costs as well. The expenses incurred on paying permission charge, purchasing food items, clothing items, tents,

health cost/ medicine. The expenditure incurred on Yarsagumba collection could be shown with the following table.

Table 4.2: Expenditure Incurred on Yarsagumba Collection

Expenditure Incurred	**Total Cost (Rs)**	**Percent (%)**
Permission Charge	208000	**2.1**
Food Items	4414000	**45.2**
Clothing Items	1929600	**19.8**
Tents	1933000	**19.8**
Health Cost/Medicine	88300	**0.9**
Others	1196385	**12.2**
Grand Total Cost	**9769285**	**100.0**

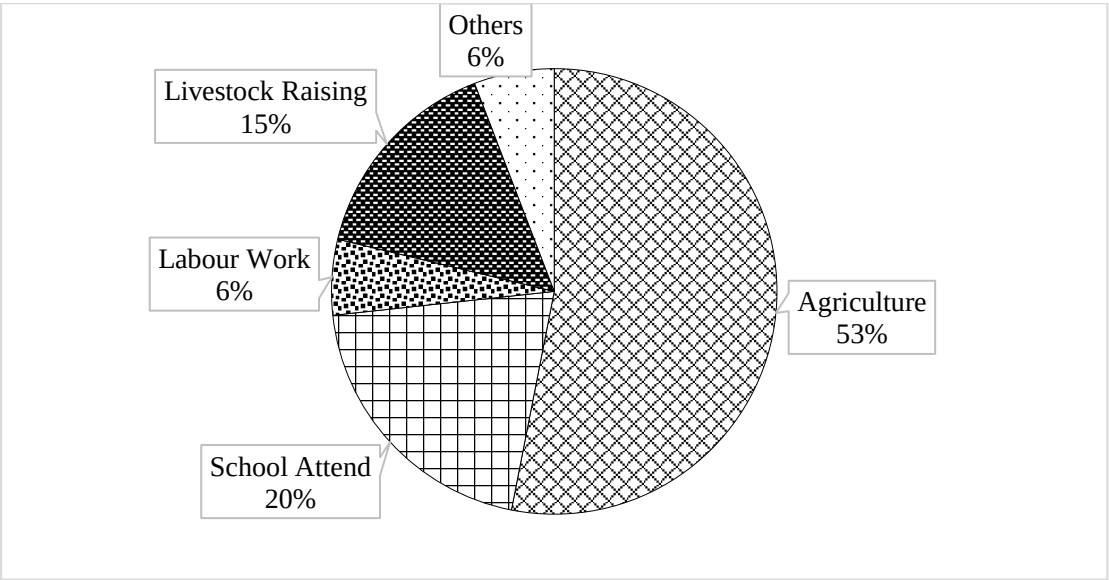
Source: Field Survey, October/November, 2017

The table 4.2 shows that majority respondents (45.2%) said that highest expenses is incurred on food items during the Yarsagumba collection. It is observed that during the Yarsagumba seasons the prices of goods and services are exuberantly high. 19.8 percent respondents said that there is more expenses on purchasing clothes and tents each.

4.2.4 Activities Foregone Due to Yarsagumba Collection

Yarsagumba collection usually take place in mid-May to mid-July. As we know that primary occupation of the people in the study area is agriculture. This is the time when agricultural activities takes place. However, many activities like agriculture farming, livestock raising, school attendance and labour works are foregone. The study shows that people are neglecting agriculture sector and livestock raising, which has adversely affected the productions of crops. This has reduced the food sufficiency level of the poor people. Additionally, Yarsagumba production has decreased in recent years as shown by the DFO data and consequently the Yarsagumba income has sharply declined. So, there is terrible impact on the livelihood of the poor mountain people.

Figure 4.10: Activities Foregone Due to Yarsagumba Collection



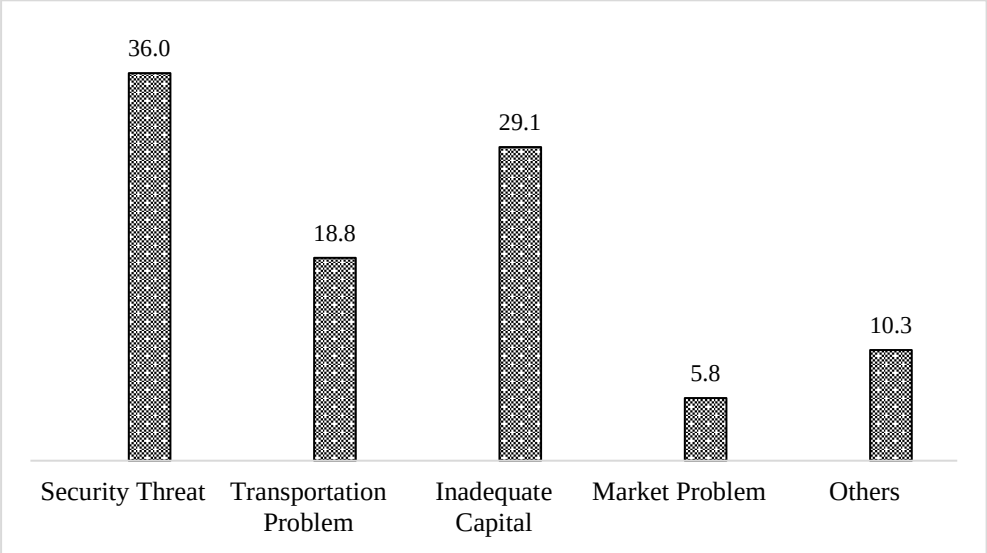
Source: Field Survey, October/November, 2017

The figure 4.10 shows that majority respondents (53%) said that agriculture is the most forgone activities. Similarly, 20 percent respondents said that school attendance was forgone which is another negative impact in the education of students. And, 15 percent respondents said that livestock raising has been forgone activity due to Yarsagumba collection. The study shows that there is activities forgone due to Yarsagumba collection in labour work is 6 percent.

4.2.5 Problems Faced During Yarsagumba Collection

There are various problems like Security, transportation, market, finance, theft etc. are faced by the Yarsagumba collectors and traders during the Yarsagumba collection seasons. It can be explained with the following figure.

Figure 4.11: Problems Faced During Yarsagumba Collection



Source: Field Survey, October/November, 2017

The figure 4.11 shows that security threat is the major problem during Yarsagumba collection. About 36 percent respondents said that security threat was the major problem. About 29.1 percent said that inadequate capital was the major problem to finance Yarsagumba collection. For 18.8 percent and 5.8 percent, transportation problem and market problem were the major problems faced during the Yarsagumba collection respectively.

4.3 Contribution of Yarsagumba Income

Livelihood of people in mountain region largely depends upon the collection and trade of medicinal and aromatic plants (MAPs) and other non-timber forests products (NTFPs). After legalization of trade on Yarsagumba in 2001, the number of people collecting Yarsagumba tremendously increased due to increased demand in the international market. Therefore, Yarsagumba collection is the major sources of cash income in the mountain region which has contributed immensely to the mountain people to up lift their livelihood. Besides direct involvement in Yarsagumba collection, there were significant opportunities of employment and economic gain in transportation of food and logistics to collection sites, tea shops, hotels, restaurants, and trade of Yarsagumba.

4.3.1 Share of Yarsagumba Income in Total Cash Income of Households

The table shows the cash income earned by 292 households from different sources. It shows that the share of Yarsagumba income is highest in total cash income of the households. The people of study area earn income from different sources as shown by the following table.

Table 4.3: Share of Different Heads of Income in Total Cash Income of Households

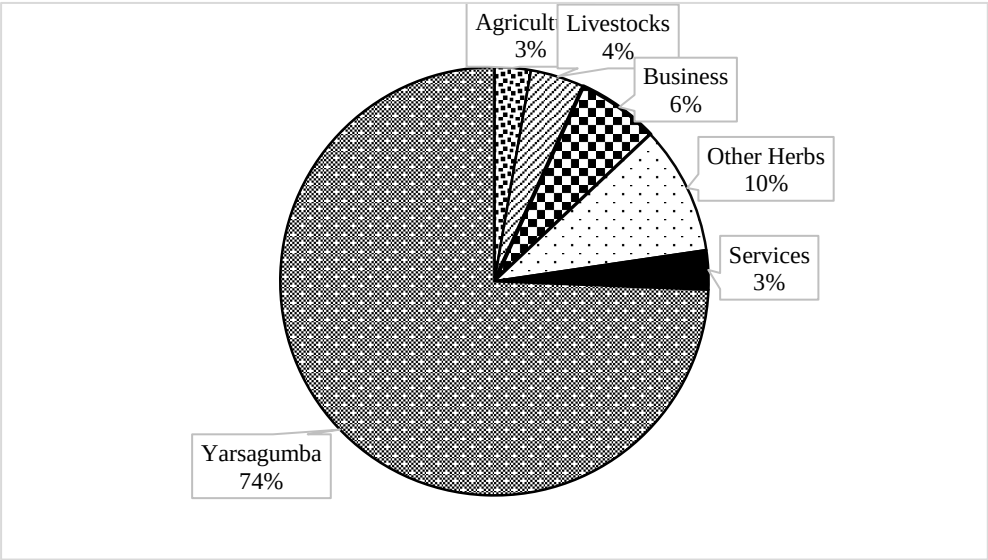
Income Source	Total (Rs)	Average income per HHs (Rs)	Percent (%)
Agriculture	1611500	5132.2	2.7
Livestock	2405500	7660.8	4.1
Business	3647000	11614.6	6.2
Other Herbs	5721819	18222.4	9.7
Services	1742000	5547.8	2.0
Yarsagumba	43889600	150306.8	74.4
Total	**59017419**		**100.0**

Source: Field Survey, October/November, 2017

The main source of cash income of Dolpali people is Yarsagumba that contributed the highest amount (74%), other herbs (10%), business (6%), livestock (4%), and agriculture (3%) and services (3%). Thus, the table shows that the share of Yarsagumba in total cash income is NRs. 150306.8. Additionally, the share of other medicinal plants is NRs. 18222.4. The figure illustrates that despite being agriculture and livestock farming have highest share in total annual income of HHs, it has insignificant contribution to the total cash income of the HHs. The study clearly depicts that majority of Dolpali people are engaged in subsistence farming. In recent years, some people in the study area have started to start small business like tea shops, clothing shops, tailoring, hotels, etc.

The table 4.3 could be also shown with following figure as:

Figure 4.12: Share of Different Heads of Income in Total Cash Income of Households



Source: Field Survey, October/November, 2017

The main source of cash income of Dolpali people is Yarsagumba that contributed the highest amount (74%), other herbs (10%), business (6%), livestock (4%), and agriculture (3%) and services (3%).

4.3.2 Expenditure Pattern of Yarsagumba Income

Most of the Yarsagumba collectors from Dolpa district are from poor households. On an average, a family earns Rs. 150 thousands. The study shows that most of the Yarsagumba income is spend to buy food/clothe, pay debt, education and entertainment. As a result the consumption habits of the people have changed. They have been neglecting agriculture and livestock farming. Borrowing habit of the people have also tremendously increased. People have started purchasing jewelleries, mobile phones and spend wastefully on alcohol and playing cards. Some people have built new houses and covered with CGI sheets. Some have started small business like tea shops, hotels, restaurants, etc. Banking habit of the people is really poor as negligible number of people have opened bank accounts. In recent years both Yarsagumba collection and agriculture production has been decreasing which may have grave consequences if not

addressed timely. The expenditure pattern of Yarsagumba income can be shown with the following table.

Table 4.4: Expenditure Pattern of Yarsagumba Income

Descriptions	**Average Expenses (Rs.)**	**Percent (%)**
Food/Clothes	39078.8	26
Education	22547.0	15
Health	7514.3	5
Festivals	9018.4	6
Business	12024.6	8
Paid Debt	24049.1	16
Luxurious Items	13527.6	9
Entertainment	15030.7	10
Others	7515.3	5
Total	**150306.8**	**100**

Source: Field Survey, October/November, 2017

The table 4.4 shows the highest amount of expenses (26%) in food/clothing, followed by loan payment (16%), education (15%), entertainment (10%), luxurious items (9%), business (8%), festivals (6%) and other miscellaneous expenditures (5%). The above table shows that highest expenses is incurred in food/clothing (NRs.39078.8), loan payment (NRs. 22547) and education (NRs. 22547.0). The study shows that majority of income from Yarsagumba is spend on HHs expense. Majority of Yarsagumba collectors are from poor households which have food sufficiency less than a year. Hence, most of the Yarsagumba collectors borrow money from traders and relatives to maintain their basic needs. So, almost 26 percent of total Yarsagumba income is used to pay debt. There is high expenses in alcohol, cigarettes, and playing cards as well. So, the study reveals that Yarsagumba income is mainly spend on HHs consumption and very little has been invested in productive sectors.

4.4 Trade, Trade Chain and Price of Yarsagumba

4.4.1 Yarsagumba Trade in Dolpa District

The main occupation of Dolpali people is agriculture which is hardly sufficient for 3 to 6 months in an average. Besides the income source from agriculture, Yarsagumba is the main alternative source of income. The commercial collection of Yarsagumba in Dolpa has been started from 1987 A.D. (2044 B.S.). Yarsagumba is the one of the high value organic Himalayan medicinal herb. There is high demand of Yarsagumba in international market.

Nepal is the second largest exporter of Yarsagumba (on an average about 3000kg per year), after China (accounts 95%) of the global export (NRB, 2072). In Nepal, Yarsagumba collection has been taking place in alomost 25 districts. But, commercial collection is carried in 12 districts namely Darchula, Dolpa, Jumla, Mugu, Bajhang, Rukum, Myagdi, Manang, Gorkha, Rasuwa, Sindhupalchwok and Sangkhuwasabha. Among them, the Yarsagumba found in Dolpa District is the most qualitative one (NRB, 2072).

Hence, the study analysed the trade and market chain of Yarsagumba in Dolpa district. For this the semi-structured interview with local traders, district level traders and international level traders were interviewed. Additionally, Key Informant Interview was also conducted with different stakeholders and the findings were developed.

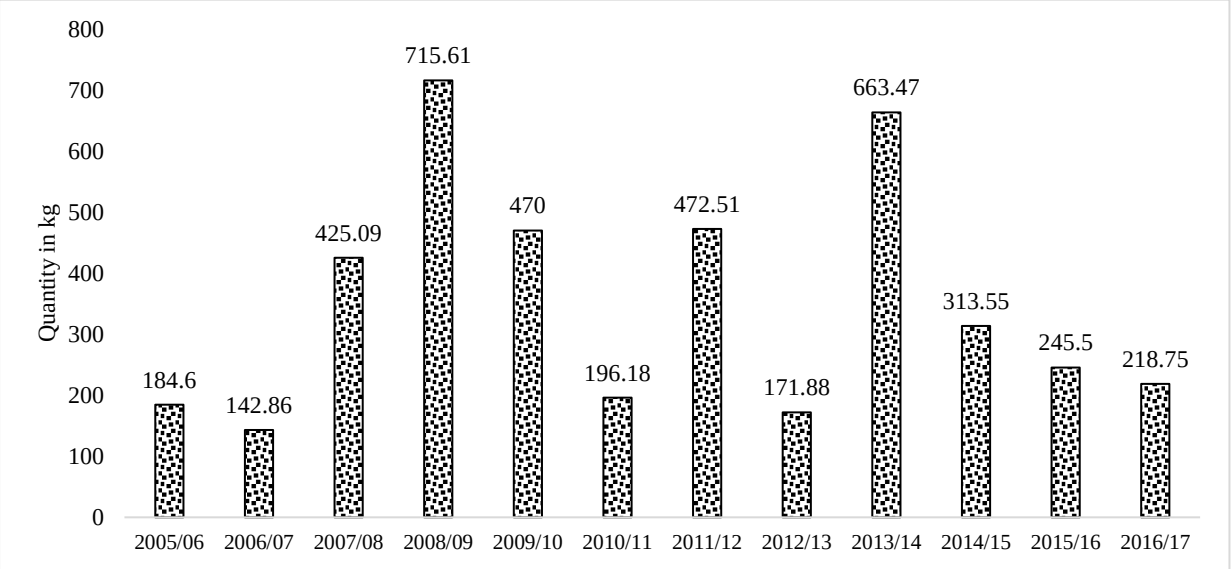
4.4.2 Trend of Yarsagumba collection in Dolpa District

The commercial collection of Yarsagumba in Dolpa has been started from 1987 A.D. (2044 B.S.) There is high demand of Yarsagumba in international market. The Yarsagumba found in Dolpa District is the most qualitative one (NRB, 2072).

Hence, the study analysed the trend Yarsagumba collection in Dolpa district. For this the semi-structured interview with local traders, district level traders and international level traders were interviewed. Additionally, Key Informant Interview was also conducted with different stakeholders like DFO, DNPWC and the findings were discussed.

The ban on Yarsagumba collection and trade was lifted in 2001 with the provision of revenue of NRs 20,000 per kg and later that revenue is reduced to NRs 10,000 per kg in 2006 (Devkota, 2010). Again the tax per kg was increased to Rs 25,000 in 2015. After legalization of trade of Yarsagumba, earnings from the harvest have continuously increased due to the increase in market price. In recent years, the collection of Yarsagumba has decreased, but, the price of Yarsagumba has increased drastically. However, the price of Yarsagumba plummeted this year. So, there is seen such fluctuations which completely dependent upon the international traders. Despite this the revenue collection from Yarsagumba continuously increased in last three years due to increment of royalty rate from Rs. 10000 per kg to Rs. 25000 per kg.

Figure 4.13: Yearly Trend of Yarsagumba Collection in Dolpa District



Source: DFO Dolpa, 2017

According to the DFO data of Dolpa, the Yarsagumba collection was 184.6 kg in 2006 which increased to 715.61 kg in 2009. As shown above, there is changes in the production of Yarsagumba between 2010 and 2014. However, the Yarsagumba productions has been in decreasing trend since 2015. The Yarsagumba production as per DFO data was 313.55 kg, 245.50 kg and 218.75 kg in 2015, 2016 and 2017 respectively. The main reason for decrease in Yarsagumba collection were due to unscientific harvesting, massive encroachment of the habitat of the caterpillar, increased density of collectors, domesticated animals like Yaks, Jhopas, mules, rapid pollution to the mountain ecosystem, untimely harvesting , etc.

4.4.3 Price Trend of Yarsagumba Sold in Dolpa District

The major market for Yarsagumba is in Beijing. Besides this, the Yarsagumba is sold in Singapore, Bangkok, Hong Kong, Korea, Japan and other European countries. Usually, the local and district level traders purchase Yarsagumba on lump sum basis paying an average price of Rs. 300 to Rs. 500 per piece in the primary collection centres. These traders separates and classify according to different grades depending upon the size, colour and compactness before selling in the international market.

Table 4.5: Price of Yarsagumba on the Basis of Different Grades (Rs. in `000)

Grade Quality	2016	2017
	Selling Price Per Kg (Rs in `000)	Selling Price Per Kg (Rs in `000)
High-A	2800 to 3000	2500 to 2700
Medium- B	2200 to 2400	2000 to 2100
Low-C	1700	1800
Black caterpillar	1100 to 1400	1500 to 1700
Black and pieces	300 to 500	800 to 1200

Source: Field Survey, October/November, 2017

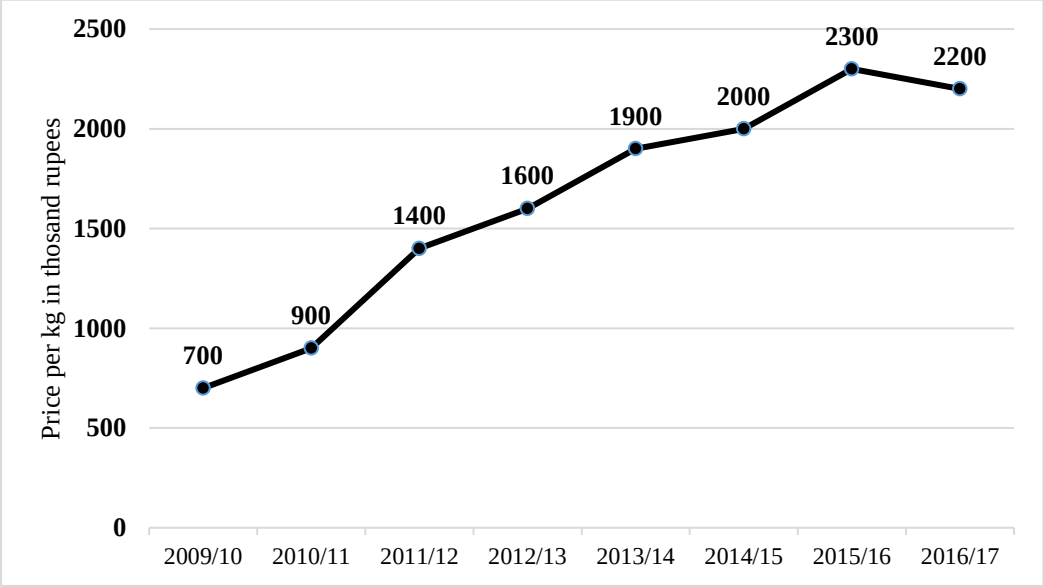
The table 4.5 shows prices per kg at which different grades of Yarsagumba were sold to international traders in these countries. In 2016, the high quality Yarsagumba was sold for Rs. 2800 to 3000 thousand per kilogram(Kg), medium quality for Rs. 2200 to 2400 thousand per Kg, low quality for Rs.1700 thousand per Kg, black caterpillar for Rs.1100 to 1400 thousand per Kg and black caterpillar with small pieces were sold for Rs.300 to 500 thousand per Kg. However, the price decreased in 2017 in the international market. So, traders of Nepal had to sell the high and medium quality Yarsagumba at lower profit margin while the black caterpillar and small pieces fetched the high profit margin. In 2017, the high quality Yarsagumba was sold for Rs. 2500 to 2700 thousand per Kg, medium quality for Rs. 2200 to 2400 thousand per Kg, low quality for Rs.1800 thousand per Kg, black caterpillar for Rs.1500 to 1700 thousand per Kg and black caterpillar with small pieces were sold for Rs. 800 to 1200 thousand per Kg. However, the price decreased in 2017 in the international market. On this regard, majority of traders from Dolpa said they were unaware of the reasons for such a contradictions and all of them voiced that the prices were mainly determined by the

international level traders' mainly Chinese traders. This may be due the increase in demand in the international market and decrease in the production of Yarsagumba.

4.4.4 Market Price Trend in Dolpa District

The information about Yarsagumba prices per kg changes from 2010 to 2017 is shown below. The data was collected from local level traders, district level traders, international traders, DFO, and key informants interviews. The data shows that on an average the price of Yarsagumba is increasing due to high demand in the international market. The primary collectors had to sell Yarsagumba at lower price due to lack of knowledge on the price of international market. The collectors did not have any alternative, they were forced to sell the product at a very low price.

Figure: 4.14: Price Trend of Yarsagumba (Rs. in `000)



Source: DFO-Dolpa, Field Survey, October/November, 2017

The figure 4.16 shows that the price of Yarsagumba is increasing every year due to its high demand and low productions. In 2010, the Yarsagumba was traded in Dolpa in Rs. 800 thousand and this trend continued with some fluctuations in some years. The price per kg remained around Rs. 2400 thousand and Rs. 2500 thousand respectively in 2016 and 2017 respectively. The data shows that the price of Yarsagumba is increasing year by year. However, the primary collectors are least benefitted while the traders who have

access to international market are greatly benefitted. So, there is huge price differential in the local market and international market.

4.4.5 Quality Grading

Globally, more than 500 species of Yarsagumba are found. But, in Nepal, about 11 types are identified. Among them, the Yarsagumba found in Dolpa district is the most qualitative one (NRB, 2015). Different physical characteristics are taken into account while grading Yarsagumba. There are three most important quality grading criteria as size-weight, colour and compactness. Quality of the product is the main parameter in determining the price of Yarsagumba in the national and international market.

Table 4.6: Quality Grading Criteria of Yarsagumba

S.N	Criteria	Description
1	Size-weight	The longer caterpillar with more weight is the best quality.
2	Colour	The more golden and bright colour is the most favoured product.
3	Compactness	The higher the compactness better the quality.

Source: Field Survey, 2017

4.4.6 Trend of Yarsagumba Revenue Collection in Dolpa District

The Non-Timber Forest Products (NTFPs) including medicinal and aromatic plants have been the main source of revenue for DFO Dolpa. Hence, the study analysed the trend of Yarsagumba revenue collection in Dolpa district. For this the data were collected from the DFO, Dolpa and Department of Forest (DoF). Additionally, some data were collected from the Sheyphoksundo national park. Key Informant Interview was also conducted with different stakeholders like DFO, DNPWC and the findings were discussed.

The ban on Yarsagumba trade was lifted in 2001 with the provision of revenue of NRs 20,000 per kg and later that revenue is reduced to NRs 10,000 per kg in 2006 (Devkota, 2010). Again the tax per kg was increased to Rs 25,000 in 2015. After legalization of trade of Yarsagumba, earnings from the harvest have continuously increased due to the increase in market price. In recent years, the collection of Yarsagumba has decreased.

Despite this the revenue collection from Yarsagumba continuously increased in last three years due to increment of royalty rate from Rs. 10000 per kg to Rs. 25000 per kg.

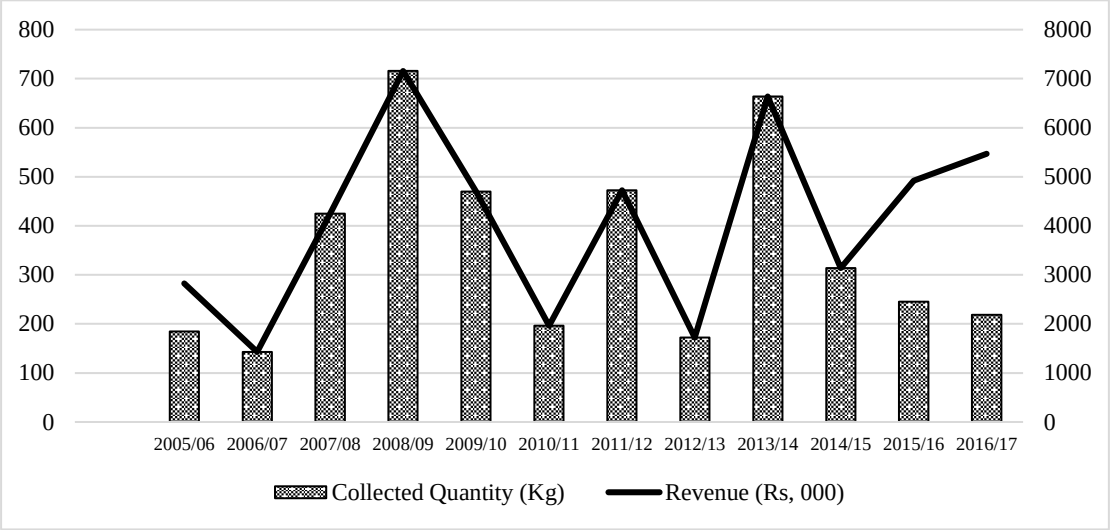
Table 4.7: Yearly Trend of Yarsagumba Revenue Collection in Dolpa District

Year	Quantity(kg)	Revenue (Rs. in `000)
2005/06	184.6	2827.0
2006/07	142.9	1428.6
2007/08	425.1	4250.9
2008/09	715.6	7156.0
2009/10	470.0	4700.0
2010/11	196.2	1961.8
2011/12	472.5	4725.1
2012/13	171.9	1718.8
2013/14	663.5	6634.7
2014/15	313.6	3135.5
2015/16	245.5	4917.5
2016/17	218.8	5468.8

Source: DFO Dolpa, 2017

The table 4.7 shows that Yarsagumba collection quantity and revenue collection at different years. The table shows that the Yarsagumba collection in 2005/06 was 184.6 kg and increased up to 715.6 kg in 2008/09. There were fluctuations between year 2009/10 and 2013/14. The Yarsagumba collection was 663.5 kg in that year. It can be noticed that over the last three years the Yarsagumba collection is in decreasing trend. Similarly, the revenue collection was Rs.2827 thousand in 2005/06 and was maximum of Rs.7156 thousand in 2009/10. If we look at the last three years trend the revenue collection is in increasing trend. It is seen that the revenue collection was Rs. 3135.5 thousand in 2014/15 and at that time the royalty rate was Rs. 10,000/kg. The royalty revenue collection was Rs.4917.5 thousand in 2015/16 and there were mixed royalty rate of Rs. 10,000 and Rs. 25,000 at that time. This caused to increase in revenue. In 2016/17 the royalty rate was fixed at Rs. 25,000 per kg for all grades of Yarsagumba. The revenue collection was Rs. 5468.8 thousand in 2016/17 and the increase in royalty rate was the main reason for the increase in the revenue.

Figure 4.15: Yearly Trend of Yarsagumba Revenue Collection in Dolpa District



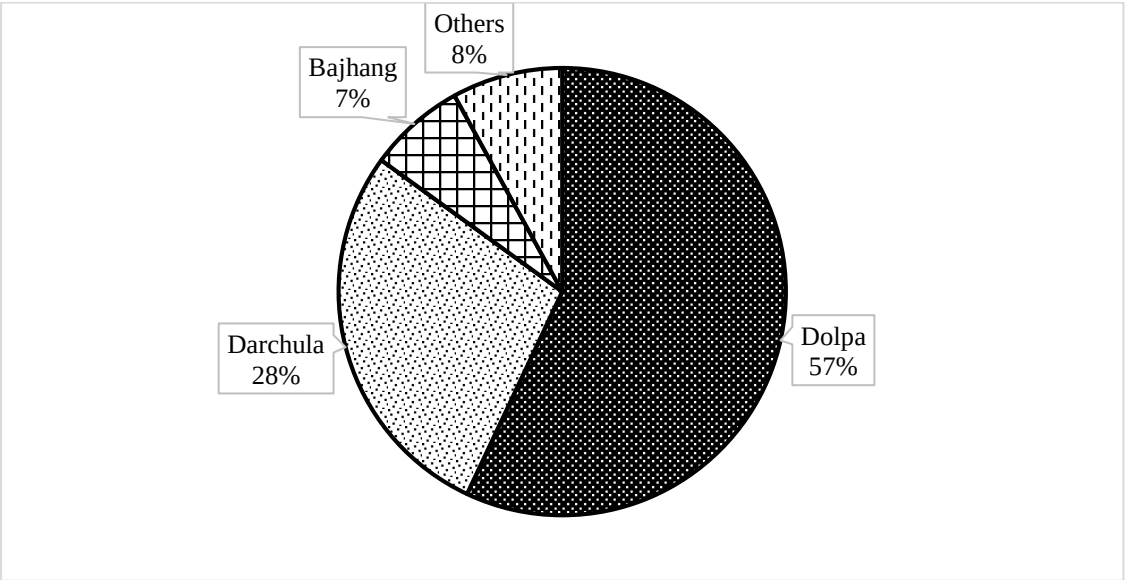
Source: DFO Dolpa, 2017

According to the DFO data of Dolpa, the Yarsagumba revenue Rs. 2827.0 thousand in 2005/06 and it drastically increased up to 2008/09 due to the increment in the production of Yarsagumba. The revenue collection was Rs. 7156.0 thousand in 2008/09. As shown above, there is continuous fluctuations in the production of Yarsagumba revenue between 2009/10 and 2013/14. The Yarsagumba revenue collection was Rs. 6634.7 thousand in 2013/14. However, the Yarsagumba productions has been in decreasing trend since 2014/15. The Yarsagumba production as per DFO data was 313.6 kg, 245.5 kg and 218.8 kg in 2014/15, 2015/16 and 2016/17 respectively. Despite decrease in Yarsagumba collection in last three years the revenue collection increased due to the increment in the royalty rate from Rs.10,000 to Rs. 25,000 per kg.

4.4.7 Share of Revenue from Dolpa to the Total Revenue of Nepal

As per the study conducted by Department of Forest (DoF), Yarsagumba collection in Nepal is found in almost 25 districts of Nepal. But the commercial collection has been started in 9 districts like Dolpa, Darchula, Jumla, Mugu, Sindhupalchwok, Rukum, Dhading, Jajarkot and Bajhang. In last 12 years the total sum of Rs.48924.5 thousand has been collected from Dolpa district alone.

Figure 4.16: Share of Revenue from Dolpa to the Total Revenue of Nepal



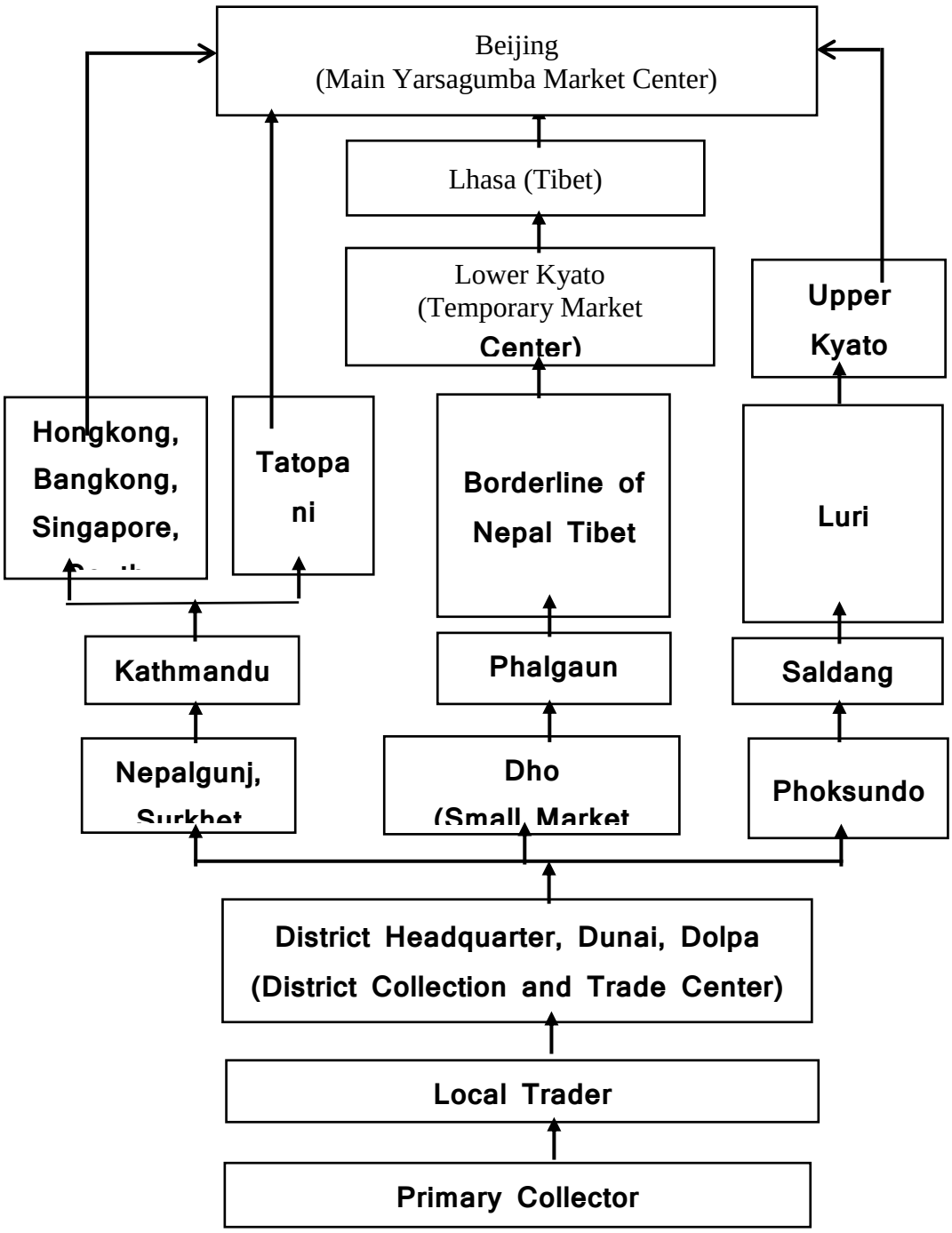
Source: Field Survey, October/November, 2017

The figure 4.18 shows that the share of revenue collection from Dolpa district is very significant compared to other districts. Dolpa district alone accounts about 57 percent of the total revenue collection by the Department of Forest. It is observed that revenue contribution of Darchula district is 28 percent which is the second highest in Nepal. Bajhang district is the third highest contributor of revenue to the DoF. The remaining districts contributes only 8 percent which is very negligible compared to the contribution of Dolpa district.

4.4.8 A General Trade Chain of Yarsagumba in Dolpa District

The primary collectors from villages collect Yarsagumba from different patans (locally known name for pastures) and sell to the local traders/primary traders in the collection sites. This kind of buying and selling takes place on the local villages and local collection centres as well. The majority of such transactions involve pre-payment to Yarsagumba collectors by traders either in terms of cash benefit or other necessary goods like rice, salt, clothing items, etc. The advance payment is provided to the poor collectors starts usually on December/January and during the festive seasons.

Fig: 4.17: A General Market Chain of Yarsagumba in Dolpa District



Source: DFO-Dolpa, October/November Field Survey, 2017

The local traders sell to the secondary traders like district level traders and regional level traders' at district collection centre. From the district headquarter, the Yarsagumba is channelized via three routes. Firstly, from district level traders take it to the Phoksundo to Saldang to Luri to upper Kyato and ultimately to Beijing, the main market canter. Secondly, the flow of Yarsagumba takes place from Dunai, to Phalgaun Tinje to Nepal Tibet boarder to lower Kyato to Lhasa and ultimately to Beijing, the main market center. Thirdly, Dunai to Juphal to Surkhet to Nepalgunj to Kathmandu to Tatopani to Lhasa to Beijing. Alternatively, from Kathmandu to Japan/Hong Kong/Bangkok/Singapore/Korea to Beijing. This shows that the ultimate market is China and that is why China accounts for the 95 percent of the global Yarsagumba trade. While trading Yarsagumba, traders have to pay the royalty to the DFO, Dolpa and Shey Phoksundo National Park.

The ban was lifted in 2001 with the provision of revenue of NRs 20,000 per kg and later that revenue is reduced to NRs 10,000 per kg in 2006 (Devkota, 2010). Again the tax per kg was increased to Rs 25,000 in 2015. After legalization of trade of Yarsagumba, earnings from the harvest have continuously increased due to the increase in market price. In recent years, the collection of Yarsagumba has decreased, but, the price of Yarsagumba has increased drastically. However the price of Yarsagumba plummeted this year, which completely dependent upon the international traders.

There was a gradual increase in price of Yarsagumba at different levels of market chain. It is observed from the market chain that local and international traders are highly benefitted compared to the primary collectors. The primary collector gets Rs. 300 to Rs. 500 per piece on an average depending upon the quality size, colour and compactness. But, while selling to the international market, it is graded under different classification and sold on the basis of per kg.

The general market trade chain could be further explained with the following tables:

Table 4.8: Value Addition across Channel I

Market Channels	Selling price per piece (NRs)	Value Addition (NRs)	Value added percent
Primary collector	300		
Local traders	350	50	16.7
District traders	500	150	42.9
National traders (Surkhet/Nepalgunj)	800	300	60.0
Kathmandu	1,000	200	25.0
Tatopani	1,500	500	50.0
China/Hongkong/Singapore	4,000	2500	166.7

Source: Field Survey, October/November, 2017

Table 4.9: Value Addition across Channel II and III

Market Channels	Selling price per piece (NRs)	Value Addition (NRs)	Value added percent
Primary collector	300		
Local traders	350	50	16.7
District traders	500	150	42.9
Dho, Phoksundo, Phalgaun Tinje, Saldang, Borderline of Nepal Tibet	800	300	60.0
Lower Kyato/ Lower Kyato	1,000	200	25.0
Lhasa	1,500	500	50.0
China	3,000	1,500	100.0

Source: Field Survey, October/November, 2017

The table 4.8 and Table 4.9 show the market trade chain along with value addition at various levels of market. As shown in the table across all channels of market the primary collectors gets Rs. 300 per piece, local traders get Rs. 350-500 per and district level traders get Rs. 500 to 1000 per piece on an average. However, the price in the international market is Rs. 3000 to Rs. 4000 per piece, which is significantly large amount compared to the prices that primary collectors are getting. So, this shows that there is a huge price differential across the trade chain.

4.5 Threat of Yarsagumba Collection to the Biodiversity of Its Pastures

The demand for Yarsagumba is increasing year by year in the international market. Nepal being the second largest exporter of Yarsagumba after China. The number of collectors in the pastures are increasing every year. So, there is high density of humans and domestic animals in the Yarsagumba pastures. So, hence, the major threats are due to haphazard and unscientific collection, hunting of wild animals (deer, blue sheep, and snow leopard), overgrazing of livestock, intentional fire, increased density of domesticated animals and their by-products, and other polluting agents. The collectors believe that intentional dire will, firstly increase the production of Yarsagumba and secondly, it will provide firewood for the next season. This activity has adversely affected the biodiversity of Yarsagumba pastures.

The domestic animals used for the transportation purpose in the Yarsagumba sites destroy the ecological niche of C. sinensis and which ultimately disturbs the flora biodiversity. Overgrazing of livestock and setting fire unnecessarily has incurred adverse impact on Yarsagumba production and other medicinal herbs.

Furthermore, majority of respondents, traders, representatives of local bodies and officials at DFO and DNPWC view that rapid increase in non-biodegradable materials like plastics, bottles and batteries have adversely affected the soil of the pastures. The illegal hunting of wild animals like Pseudois Nayar (Naur), Uncia urcia (Hiuchituwa), Lophophorus impensensus (Danfe), Muschus chrygaster (Kasturi), etc. are adversely affected. So, due to lack of proper regulation and monitoring the wild animals are hunt for its flesh and other parts for trade.

4.6 Positive Impact of Yarsagumba Income

Yarsagumba collection has helped the people of mountain region to sustain their livelihood. The majority of the Yarsagumba collector's households have food sufficiency less than 6 months. This clearly illustrates that Yarsagumba collection has provided the alternative source of living for the poor people of Dolpa district. The Yarsagumba income accounts almost 74 percent of the total cash income.

The study analysed the present status of Yarsagumba collection, expenditure pattern of the income generated from Yarsagumba and its trade chain. So, the focused on analysing the socio economic contribution of Yarsagumba collection in Dolpa district and further assessed its impact on the rural people of the study area. The present study shows that Yarsagumba has made the following positive impacts.

- Major cash in income: Every year thousands of people go for the Yarsagumba collection in Dolpa district. The food sufficiency of the people of the study area is less than 6 months. So, Yarsagumba income is the major source of cash income for the mountain people.
- Revenue to the government: According to DoF, the revenue contribution of Yarsagumba collection from Dolpa district is very significant compared to other districts. Dolpa district alone accounts about 75 percent of the total revenue collected by Department of Forest.
- Education of the children: The study found that Yarsagumba is the biggest contributor to the cash economy of the poorest people, playing a key role in alleviating poverty by allowing isolated highland families to send their children to school. Now a days most of the households are now able to send their children to district headquarter and the major cities like Kathmandu, Nepalgunj, Pokhara and Surkhet for better education opportunities.
- Contribution to health: The poor people use cash income from Yarsagumba to receive health service if needed. The level of awareness about health and hygiene is gradually increasing due to increased exposure. Some people use Yarsagumba for lever disease, diarrhoea, headache and cough. Yarsagumba income has allowed many people to visit the dream destinations like Kathmandu. The majority of the local people are aware of health care and able to manage the cost of modern treatment and visiting the hospitals in Nepalgunj and Kathmandu.
- Small business enterprise: Small scale business activities like hotels, tea houses, clothing stores, lodges, etc. have increased in Dolpa district.
- House construction: Many Yarsagumba collectors have invested money to build their houses and covered their house roofs with CGI sheets.

- Increased purchasing power: Female collectors are able to purchase gold and silver ornaments. Some collectors are able to mobile phones, TV, CD/DVD players, solar panels, etc.
- Debt Payment: The study shows that some people have been able to pay the loan.

4.7 Negative Impact of Yarsagumba Income

The study showed that the Yarsagumba income has the negative impact to the mountain people as well. The present study shows that Yarsagumba has made the following negative impacts.

- Agriculture sector is neglected: Yarsagumba collectors are abandoning agriculture activities and traditional farming system. The Yarsagumba collectors are neglecting livestock farming as well. As a result of this agricultural production is decreasing year by year which may push poor people in the vicious circle of poverty.
- Schools closed: During the Yarsagumba collection season, local schools are informally closed because both the teachers and students go for Yarsagumba collection. It has adversely affected the teaching and learning habits.
- Substance abuse and increased gambling habit: Yarsagumba collectors have been spending money on purchasing luxurious goods and they have become more wasteful as they spend money on alcohol, cigarettes and gambling.
- Less care for senior citizens and small babies: Mostly, youth and energetic people have to leave home in the search of Yarsagumba as a result small babies and senior citizens are less cared.
- Risking lives: The Yarsagumba pastures have geographically harsh terrains. As a result some people are injured and some people have to loss their life.
- Social crimes increased: The social crimes like robbery, theft, quarrels, community conflict has increased in the recent years.

4.8 Conservation Perspectives of the Respondents

Based on HHs surveys with 292 HHs, the study shows that about 90 percent of the Yarsagumba collectors believe that the availability of the caterpillar in the pastures to be declining and about 80 percent respondents said that current harvesting practices is not sustainable. They were aware of the fact that the caterpillar harvested were reproductively immature and which impedes reproduction, which causing decrease in both moth and larvae populations. Most of the harvesters interviewed are aware of that the Yarsagumba production has been declining in recent years due to over-harvesting of immature Yarsagumba. About 50 percent collectors said that increased grazing intensity of domestic animals like horses, mules, Jhopas, and Yaks, increased intensity of Yarsagumba collectors and climate change (low and untimely snowfall, erratic rainfall, increased temperature) were major reasons for loss of favourable habitat of caterpillar which ultimately caused decline in Yarsagumba collection. Some people said that intentional fire in the pastures adversely affected the caterpillar population.

Most of them were worried to notice the declining trend of Yarsagumba in its pastures. The majority of recommended that Yarsagumba harvest should be conducted in alternate years or rotational basis and the use of domesticated animals in the Yarsagumba pastures should be strongly discouraged. Similarly, the time period for the Yarsagumba collection should be fixed and those who are not abiding by the rules should be penalised with high cash penalties.

There should be close coordination between security bodies, local bodies, local people, CFUGs, national park and DFO. Taxes raised should be utilized to support conservation of caterpillar and for this, there should be strong governance structure and increase the level of awareness among harvesters. Indigenous technical knowledge should be carefully to develop effective conservation strategies in safeguarding caterpillar genetics resources, conserve ecosystem and improve the wellbeing of local people. Every possible measures should be taken in order to maintain healthy environment, practice sustainable harvesting and provide income to the poor mountain people for generations to come. There is an urgent need to enforce laws to provide local bodies with full control over resources with community based conservation approaches.

CHAPTER- V

FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Summary of Findings

Yarsagumba, a highly regarded herb, is commonly known as Jivanbuti, Sarambuti, Kira chyau, Kira Jhar, etc. Yarsagumba is an economic specie, which is contributing a significant amount in national economic of Nepal. There is a huge demand for it in China due to its reported medicinal and aphrodisiac properties. A unique caterpillar fungus, popular known as "Himalayan Viagra", is changing the lives of thousands of peoples in Dolpa district of Nepal. The study shows that China accounts for nearly 95% percent of the total production and Nepal is the second highest exporter of Yarsagumba. In Nepal commercial collection of Yarsagumba is started in 12 hilly and mountain districts of Nepal. The study shows that on an average an individual earns Rs 50,000 during the collection season. The study shows that the average earning of a family is Rs 150 thousand on an average from collecting Yarsagumba.

Harvesting of Yarsagumba, one of the most expensive biological commodities in the world, has become an important livelihood strategy for mountain communities of Nepal. In Nepal, the harvest of Yarsagumba was banned till 2000 under the Forest Act 1993 and Forest Regulations 1995. The ban was lifted in 2001 with the provision of revenue of NRs 20,000 per kg and later that revenue is reduced to NRs 10,000 per kg in 2006 (Devkota, 2010). Again the tax per kg was increased to Rs 25,000 in 2015. After legalization of trade of Yarsagumba, earnings from the harvest have continuously increased due to the increase in market price. In recent years, the collection of Yarsagumba has decreased, but, the price of Yarsagumba has increased drastically. There is a huge price differential in the local and international market.

The Yarsagumba found in Dolpa District is the most qualitative one (NRB, 2072). Similarly, the revenue contribution of Yarsagumba collection from Dolpa district is very significant compared to other districts (DoF, 2068). Therefore, in Dolpa about 70 percent of the inhabitants are involved in Yarsagumba harvesting, income from Yarsagumba play a key role in fulfilling basic needs, educating children, health services, construction of new houses and improving food security. Some of the negative

impact of Yarsagumba collection in Dolpa district are neglecting agriculture sector, schools closed, substance abuse, increased gambling habit, less care for senior citizens and children, risking lives and increase and social crimes.

The following are the major findings of the study:

- The study shows that 75 percent of the total respondents have agriculture and livestock raising as the major occupation, business (19.5%) and services (5.5%). Mostly the age between 25 to 35 years are involved in Yarsagumba collection and it is harvested from more than 24 pastures in the study area. In recent years people have started small business enterprises like hotels, tea shops, clothing stores, groceries, etc. However, 71 percent of the total respondents have food sufficiency level less than 6 months. Hence, Yarsagumba income is the major alternative source of income.
- Most of the Yarsagumba collectors are neglecting agriculture and traditional farming system. As a result of this agricultural production is decreasing and dependency in Yarsagumba collection is increasing, which is not sustainable. 37 percent respondents shared borrowing loan as their coping mechanism of food deficiency, 20 percent reduced consumption level, 15 percent sold their livestock to meet their food deficiency level, and 14 percent harvested and sold other herbs as adaptive strategy to meet their food deficiency.
- About 2-3 members from each household in the study area are engaged in Yarsagumba collection and 50 percent of the respondents have been involved in it for more than 7 years. Each family collect about 500 pieces on an average. The study shows that about 45 percent and 32 percent respondents take loan from traders and relatives respectively to finance Yarsagumba collection. So, 65 percent of the loan taken is used for purchasing food and clothing items during Yarsagumba collection.
- The study findings shows that livelihood of the mountain people largely depend upon Yarsagumba collection and Yarsagumba income contributed NRs. 150306.8 (74%) to the total cash income of the households. The other main sources of cash income are other medicinal herbs NRs. 18222.4 (10%), business NRs. 11614.6 (6%), livestock NRs. 7660.8 (4%), etc. The highest amount of expenses NRs. 39078 (26%) in food/clothing, repayment of loan NRs. 24049

(16%), education NRs. 22547 (15%), entertainment/festivals NRs. 24048 (16%), luxurious item NRs. 13527 (9%) and business NRs.12024 (8%).

- According to the DFO-Dolpa, the Yarsagumba collection in 2013/14 was 663.5 Kg and decreased during subsequent years which finally reached 218.8 Kg in 2016/17. The revenue collection in 2013/14 was NRs. 6634.7 thousand, NRs. 3135.6 thousand in 2014/15 and increased during subsequent years to reach NRs.5468.8 thousand in 2016/17. Despite decrease in Yarsagumba collection in last three years the revenue collection increased due to the increment in the royalty rate from NRs. 10000 per Kg to NRs. 25000 per Kg.
- The price of Yarsagumba is increasing year by year on an average as it was NRs. 700 thousand and NRs. 2300 thousand per Kg respectively in 2009/10 and 2015/16 respectively. However, it was decreased to NRs. 2200 thousand per Kg in 2016/17 due to price changes in the international market. The price of Yarsagumba is different for different grades of Yarsagumba sold in the international market.
- The Yarsagumba collected in Dolpa district is traded though different channels from the primary collectors to the international traders. The primary collector gets NRs 300 to NRs. 500 per piece on an average. However, the international traders are getting NRs 3000 to NRs. 4000 per piece depending upon the quality, size, colour and compactness. So, the study shows that primary collectors are getting least price whereas traders in the international market are largely benefitted due to Yarsagumba trade.
- The study found that Yarsagumba is the biggest contributor to the cash economy of the poorest mountain people, playing a key role in alleviating poverty by allowing isolated highland families to send their children to schools, buy food/clothes, payoff debt, build new houses, celebrate festival and mange health expenses. However, the tendency of borrowing money in advance to fulfil their basic needs is rapidly increasing in the study area. Due to decrease in Yarsagumba in recent years, most collectors are unable to pay off debt and gradually, some people are falling in to debt trap. Some of the other negative impact of Yarsagumba collection are schools are closed, substance abuse and increased drinking habits, less care for children and elderly people, increased social crimes and increased impact on environment.

5.2 Conclusions

Yarsagumba is contributing a significant amount to both the rural and national economy of Nepal. Yarsagumba is renowned for its high valued medicinal herbs which is exported to international market, especially contributing significantly for cash income of the households and revenue to the government. The food sufficiency of the majority people in the study area is for less than 6 months. Yarsagumba income is main alternative source of livelihood of the mountain people. So, most of the Yarsagumba income is spent to address their basic needs and very little is invested in business. Similarly, for the last couple of years, the demand of Yarsagumba is increasing in the international market and however, the Yarsagumba collection is decreasing in the Dolpa district.

Due to recent years decreasing trend of Yarsagumba, many Yarsagumba collectors are unable to pay off the loan and gradually, some people are falling in to debt trap. Additionally, Yarsagumba collectors are abandoning agriculture activities and traditional farming system. The Yarsagumba collectors are neglecting livestock farming as well. As a result of this agricultural production is decreasing year by year which may push poor people in the vicious circle of poverty. Hence, there is decrease in Yarsagumba production in one hand and decrease in agriculture production in other hand, which threatens the livelihood of the mountain people.

Most of the collectors prefer to sell the collected Yarsagumba to the international or Tibetan traders. However, they have not been able to access them and are compelled to sell to the local traders. There is a huge price differential exists between the local and international market meaning those who gather the fungus earn only a small share from the trade. The absence of regulation not only allows over-harvesting but is also reinforcing the inequalities among those profiting from this trade. Similarly, trading is difficult to comprehend because harvesting is sometimes done clandestinely and is sold in the black market. So, there is less revenue to the government. Hence, the government should make plans and policies and implement effectively for the sustainable harvesting of Yarsagumba so that there is win-win situation for all the people involved in it.

5.3 Recommendations

Based on the findings of the study, the following recommendations have been made for the households and national level for sustainable harvesting practices.

- Effective National policy guidelines is needed to prevent devastating changes in mountain ecosystem due to haphazardly and untimely harvesting of Yarsagumba. While remembering the lucrative benefit behind Yarsagumba we should not neglect the fact that it also has substantial ecological costs.
- For this, conservation education and public awareness is needed to ensure that Yarsagumba is harvested after sufficient spore dispersal. In addition, the collection should be carried out on a rotational basis. Strong regulation and monitoring of Yarsagumba harvesting is needed at a local level to control early harvesting, illegal trade and ensure sustainable harvesting.
- Government should take an initiative to purchase the Yarsagumba directly from the collectors. Then, the government should collaborate with private sector further process and sell of collected Yarsagumba in the international market which benefits to all. This will prevent over-harvesting and reduce the inequalities among those profiting from this trade.
- Majority of people have started neglecting agriculture activities and livestock farming. The people should be encouraged to invest in small business enterprises, promote tourism activities, etc. that allows flow of cash unproductive to productive sectors.
- The government in collaboration with local bodies, should provide incentives for providing loan to households at a reasonable interest rate that develops their banking habits which will further motivate households towards productive occupations.
- The government should channelize the informal trade towards Tibet and streamline it to formal channel by establishing temporary check post that will increase the revenue to the government.