SOCIO-ECONOMIC IMPACT OF MUSHROOM FARMING IN LOCAL COMMUNITY:
A STUDY OF KALIKA MUNICIPALITY, PADAMPUR, CHITWAN DISTRICT

A Thesis

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DECLARATION

I hereby declare that the thesis entitled **Socio-Economic Impact of Mushroom Farming in Local Community: A Study of Kalika Municipality, Padampur, Chitwan District,** has been submitted to the Department of the Rural Development, Saptagandaki Multiple Campus, Bharatpur-Chitwan, is entirely my original work prepared under the guidance and supervision of my supervisor. I have made due acknowledgement to all ideas and information borrowed from the different sources in the course of writing this thesis. The results of this thesis has not been presented or submitted anywhere else for award of any degree or for any other purposes. I assure that, no part of the content of this thesis has been published in any form before.

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RECOMMENDATION LETTER

This is to certify that the thesis entitled **Socio-Economic Impacts of Mushroom Farming in Local Community: A Study of Kalika Municipality, Padampur, Chitwan District,** has been prepared by **Sushil Koirala** under my supervision and guidance. I hereby recommend this thesis for final approval and acceptance.

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The thesis entitled **Socio-Economic Impacts of Mushroom Farming in Local Community: A Study of Kalika Municipality, Padampur, Chitwan District,** submitted by **Sushil Koirala** in partial fulfillment of the requirements for the Master's Degree of Arts in Rural Development has been evaluated and approved by the evaluation committee.

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ABSTRACT

Mushroom cultivation can directly improve livelihoods through economic, nutritional and medicinal contributions. Mushroom is a popular food due to their special flavour, nutritive value and medicinal properties. Mushroom cultivation can help reduce vulnerability to poverty and strengthens livelihoods through the generation of a fast yielding and nutritious source of food and a reliable source of income. Mushroom cultivation will improve the socio-economic condition of farmers, families and solve employment problems of both literate and illiterate of rural areas and semi-urban.

The main purpose of this study was to determine the impact of mushroom cultivation on socio-economic condition of beneficiaries. The study also aimed at explaining the socio demographic characteristics of the respondents with exploring the relationship between all these characteristics and their income from mushroom cultivation of the respondent.

The research study was conducted on socio-economic impacts of the mushroom farming to the local community of Padampur, Kalika-Chitwan who were directly involved in the same. It was a descriptive as well as analytical study of about the socio-economic impacts of the mushroom farming. Total 50 HHs were randomly selected to fulfill the objectives of the research. The pre-structured questionnaire was designed to meet the objective of the study and was filled by the key person as a respondent.

In this research, socio-economic impact of mushroom farming on farmers was analyzed thoroughly. Farmer's education and occupational background, land holding size, structure of the house, no. of livestock in house, social respect and medical treatment by their family members have been found continuously improved.

Regarding the age group of respondents, 38% of the 50 HHs belong to age group 40-50. Based on the field survey it was concluded that most the respondents 46% were appeared school level education. Based on the field survey it was concluded that most the respondents 46% were appeared school level education. It was concluded that the percentage of the children going to private school has been increased as compared to before, data interpretation shows that 46% of the HHs sends children to private school for good education. Regarding social structure 32% HHs mushroom growers belong to janjati and only 4% belong to dalit sector while brahaman and kshetri are 20% each.

According to study 90% HHs growing oyster mushroom due to ease of production and profit within short time while 4% of HHs growing both oyster and white button mushroom. They were increased saving in banks and also agreed on overall financial improvements after starting mushroom farming. 80 % in the HHs out of 50 HHs agreed for getting better medical treatment as compared to before, Overall, it was concluded that people involved in mushroom farming were having better social and financial status as compared to before which was based upon the data provided by the 84% of the HHs in 50 HHs.

The mushroom farming is gradually increased with facing different constraints found during survey. The major problem facing are lack of information about marketing, availability of good quality spawn, high price of spawn, lack of technical knowledge to increase productivity, marketing, product storage, preservation and product development and non-availability of technically sound labour.

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ACRONYMS/ABBREVIATIONS

ABC	Agro Business Center
CAT	Centre for Agriculture Technology
CBS	Central Bureau of Statistics
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GAP	Good Agriculture Practices
GDP	Gross Domestic Product
GON	Government of Nepal
HP	Himanchal Pradesh
ha	Hectare
HHs	Households
INGO	International Non- Governmental Organization
ICIMOD	International Centre for Integrated Mountain Development
IRS	Internal Revenue Service
Kg	Kilogram
KI	Key Informant
KIS	Key Informant Survey
MT	Metric Ton
NARC	Nepal Agriculture Research Council
NGO	Non- Governmental Organization
UK	United Kingdom
UN	United Nation
UNDP	United Nation Development Program
US	United States
VDC	Village Development Committee

CHAPTER-I: INTRODUCTION

1.1 Background of the Study

Agriculture sector, contributing to more than one third of Gross Domestic Product (GDP) and employing two-thirds of the country's labour force is central to the livelihood of every Nepalese people. The agriculture sector is pivotal to increase income, alleviate poverty and uplift the living standard of the Nepalese people. However, the performance of this sector has been inadequate to meet the increasing food demand and livelihood needs of growing population in the country. In the context of the recent global and national food crisis, recent unprecedented rise of the price of foods, the role of agriculture remains in mitigating food crisis, etc. The aim of agricultural based least developed countries lies in reducing poverty and resolving economic woes (Gauchan, 2008). The share of the agriculture sector in GDP is 28.9 percent while about two third of the population is engaged in this sector. Since time immemorial, agriculture has been the basic profession for livelihood. Despite decreasing share of the agriculture in the world economy with development and expansion of other sectors, size of the production of this sector has been growing. The agriculture sector occupies 28.9 percent of the Nepalese economy. Population engaged in agriculture profession, however, is around two third. Agriculture sector could not be linked to other sectors of the economy modernizing this sector. Due to the failure to make feel agriculture a dignified occupation, this sector has not developed to the extent desired (Economic Survey 2016/17)

As agriculture is the source of raw materials for industrial development, Prime Minister Agriculture modernization project to be financed from internal resource has been launched from FY 2016/17 forming a supplementary project of agriculture development strategy to promote agricultural entrepreneurship. In the process of identifying feasible commercial agriculture production area super zones of 1,000 hectare land in each of seven provinces under this program, 30 zones of 500 hectare have been identified. Similarly, 2,100 small pocket areas of 10 hectares each have been identified including 600 in the proximity of postal roads and 200 in and around the mid-hill highway (Economic Survey 2016/17).

Mushroom production has taken an up-north curve in the past 5 years. Where the market saw the steepest hike in 2015/16 from 2014/15. The total production of fresh mushroom was only 1,530

metric tonnes in 2011/12, which rose to 1650 metric ton in 2012/13, and 1900 metric ton in 2013/14 and then 2,700 in 2014/15 and by 2015/16 the production rose to 9300 metric tonnes. This clearly shows a 600 percent rise in production of mushroom since 2011 to 2016. About 16919 kg fresh or chilled preserved mushroom and 547 kg dried mushroom has been export to foreign country mainly China whereas 219679 kg fresh or chilled and 2986 kg of dried mushroom has been imported from India and other country in fiscal year 2072/73 (Statistical information on Nepalese Agriculture, 2072/73).

Mushroom, and edible fungus, has been used as a food item since ancient times. Mushrooms are a special group of macroscopic fungi that lack chlorophyll and therefore, need substrate for their own absorptive nutrition. Mushrooms produce enzymes that degrade complex organic matter and absorb the soluble substances. The amount of protein in mushroom is double than any other vegetables. So, it is called vegetable protein. In fact, mushrooms also contain low fat, low calories and good vitamins. Mushroom is the source of extra ordinary power and virility and is used in the preparation of many continental dishes (Chang and miles, 1989). They are good source of protein, vitamins and minerals (Khan *et al.*, 1981) and contain about 85-95% water, 3% protein, 4% carbohydrates, 0.1% fats and 1% minerals and vitamins (Tewari, 1986). It will provide the people with an additional vegetable of high quality, and enrich the diet with high quality proteins, minerals and vitamins which can be of direct benefit to the human health and fitness (Alam and Manjur, 2005). Also according to Pal and Chakraverty, (1977) mushroom produces high quality and quantity protein from worthless agro waste, which is superior to other plants proteins.

Mushroom cultivation might serve as means of generating employment, particularly for rural women and youths in order to raise their social status. By practicing mushroom cultivation farmers can contribute successfully and significantly to the economic development. It will also provide additional work for the farmers during winter months when the farming schedule is light. So, mushroom cultivation plays a vital role for socio-economic development of mushroom beneficiaries. Considering the above mentioned facts the present study was undertaken to determine selected socioeconomic characteristics of the mushroom beneficiaries of concerned area; and to show and describe impact of mushroom cultivation on the mushroom beneficiaries.

1.2 Statement of the Problem

Since, agriculture is the principal driving forces of the rural economy, and for these developing countries like Nepal. Countries without substantial resources other than agriculture, obviously,

depend on agriculture for economic growth. The agricultural sector, as a base of national economy till date, has been providing semi-employment, under-employment and employment to the rural as well as urban rural population and in a small scale the industries are supplied the raw materials. Mushroom cultivation has great potential and is one of the most incomes generating activity. Nepal's remarkable diversity has immense potential for cultivation of many kinds of mushroom which can contribute to the society.

Mushroom farming is mostly concentrated in peripheral areas around major urban centers such as Kathmandu valley, Pokhara and Narayanghat. Mushroom farming is increasingly becoming attractive to small farmers around urban centers. Mushroom farming done around Narayanghat is also dominated by small farmers. The farmers in rural areas are yet to be convinced about the profits of mushroom farming. In these remote areas, mushroom consumed are mostly wild mushroom brought from forest. Since there is lack of scientific technique to test the poisonous nature of wild mushroom, every year many people die due to its consumption.

It requires relatively less time to grow and harvest mushroom. White button mushroom can be harvested within 3 months and oyster mushroom can be harvested within 1 to 2 months. Hence farmers can earn profits within short time. With few techniques, it can also be grown in off season. So it gives income to farmers around the year. This is also reason why other species are not much grown. Shiitake takes about 8 months to grow. Hence farmers claim that they cannot wait for so long as they have to pay back their loans. This farming can be done with less investment. The farmers can decide to grow according to the amount they can invest. This is very crucial factor considering the weak economic condition of most of the farmers in Nepal. The investment required in this farming makes it feasible for farmer. Mostly agriculture by-products are used, which is easy for farmers to obtain. Unlike other agronomic crops, the set-up, costs-benefits and space for mushroom cultivation are recommendable. Fertilizers, machinery and pesticides are not much used, the market price is relatively high and profit margins for mushroom crops can be considerably higher than traditional crops. In general the project takes very little space and can produce returns within a short period of time.

The farmers are also receiving less training. Many farmers are afraid to start mushroom farming because they do not have knowledge about investment, profits and loss that may be involved in this. Many mushroom farmers also have incomplete knowledge because of which they consider this farming as gambling and its production to be determined by fate. They often find themselves

helpless when diseases spread in their farm. There is also lack of awareness among consumers regarding the nutritional and medicinal value of mushroom. Due to this, there is no demand of high value mushrooms, and hence there is no supply.

This study will be focused on the income generation via mushroom farming and its impacts on social and economic status of the local community. This case study will try to get the answers of following questions:

i. Why small land holder or space farmer are attracting on mushroom cultivation?
ii. What are the consequences of mushroom farming to the family directly involved in it?
iii. Do they only depend on mushroom farming or others too?
iv. What are the subsidies provided by the government, NGOs and INGO to attract and motivate the people on mushroom farming?

1.3 Rationale of the Study

Recently, unemployment is increasing rapidly both in developed and developing countries. In this situation, self-employment can be one important way to increase employment rate for small, marginal poor farm households for generating employment and earning extra money. They can easily cultivate mushroom in their home yard because it requires small piece of land where mushrooms can be grown.

Mushroom cultivation can directly improve livelihoods through economic, nutritional and medicinal contributions. Mushroom is a popular food due to their special flavour, nutritive value and medicinal properties. Mushroom cultivation can help reduce vulnerability to poverty and strengthens livelihoods through the generation of a fast yielding and nutritious source of food and a reliable source of income. It is an indoor crop, grown independent without sunlight and do not require fertile land and can be grown on small scale as it does not include any significant capital investment. Mushroom cultivation will improve the socio-economic condition of farmers, families and solve employment problems of both literate and illiterate of rural areas and semi-urban. Promotion of mushroom cultivation could relieve pressure on land, increase food and nutritional security and uplift the status of women through earning additional income and in household decision making. Mushroom substrate can be prepared from any clean agricultural waste material, and mushrooms can be produced in temporary clean shelters. They can be cultivated on a part-time basis, and require little maintenance. Mushroom cultivation activities can play an important role in supporting the local economy by contributing to subsistence food

security, nutrition, and medicine; generating additional employment and income through local, regional and national trade; and offering opportunities for processing enterprises such as pickling and drying.

Commercialization of agriculture and its promotion has been one of the most debated issues in Nepal, and therefore, there have been a number of talks to galvanize a static way out to promote agriculture. To develop this sector as an industry a number of plans, policies and strategies have been formulated to address the agricultural challenges and reduce poverty but agriculture promotion has been remained in slogan. Thus, this research is expected to serve as a tool to formulate the policy in line with approaching the agricultural sector in a new and visionary way and as useful literature for the research scholars. Further the research would be useful for the policy designers, government planners, contract growers and firms in respect to initiate contract farming as an alternative to replace conventional farming which serves both- reduce import and create employment. And hence, the problems of rural unemployment, malnutrition and food insecurity reduced substantially promoting stable rural economy.

The rationale of this paper therefore was to investigate the drivers and consequences of mushroom farming in Kalika municipality, Chitwan district and find out its implications on the livelihoods of the people.

Mushroom farming is an emerging cash crop in agriculture sector and the nation. Thus it is essential that research and studies be carried out to document the authentic scenario of the extent of mushroom farming and its drivers and the probable consequences in the livelihood. This will be helpful at a broader level to ensure a timely switch to cash crops from traditional cereal cultivation and enable the authority to overcome the threat on unemployment, poverty, loss of productive human resource through increased migration both internal as well as external and environmental deterioration.

This case study will help in the following aspects:

i. To understand the consequences of mushroom farming for those people who are willing to do this.
ii. To know the cost of production for mushroom farming.
iii. To understand how this cash crop farming helps to improve social and economic status of the farmer.

1.4 Objective of the Study

The objectives of the desertion are presented as follows;

i. To identify the socio-economic condition of the families involved in mushroom farming.
ii. To analyze the degree of improved life style through mushroom farming of those families.
iii. To find out the problems face by the mushroom farmers.

1.5 Scope of the Study

The study is based on field visit, focused group discussion, key informants survey, household survey, close observation as well as desk review. This study is primarily concentrated on exploring the living standard of farmers after adopting mushroom farming. The case study will cover Kalika municipality ward no.2 and 3 namely Padampur only.

1.6 Limitations of the Study

i. It will analyze the socio-economic impacts of mushroom farming on farmers only but not all the stakeholders.
ii. This dissertation will study the impacts on Kalika-2 and 3, Padampur only due to time constraints.
iii. The data analysis is based on simple statistical techniques. The sophisticated statistical tools are not adopted for the generalization of this study.

1.7 Organization of the Study Report

The study has been organized into five chapters. The first chapter comprises of general introduction of the study and is focused on qualifying the context of the study followed by the statement of problems, rationale and objectives. Second chapter highlights the literatures reviewed in line with the objectives of the study. The third chapter is focused on research methodology applied to accomplish the research. The fourth chapter highlights the findings and discussion which is based entirely on the primary data collected by the researcher from field survey, group interviews, focus group discussions and key person's interview. The data collected was interpreted and analyzed with due considerations to the information gathered from various secondary literatures. The fifth chapter consists of the summary, conclusion and recommendation.

CHAPTER-II: LITERATURE REVIEW

2.1 General Introduction

Agriculture sector forms the basis for overall development of the country. The sector is pivotal to increase income, alleviate poverty and uplift living standard of Nepalese people. Recent evidence consistently shows that agricultural growth is highly effective in reducing poverty. Gross Domestic Product (GDP) growth originating in agriculture is about two times more effective in reducing poverty than GDP growth originating outside the sector. Many countries that had fairly high agricultural growth rates saw substantial reductions in rural poverty. The contribution of agriculture in food, raw materials, and financial surplus (including foreign exchange) to invest is essential for the process of industrialization in its early stages. Agricultural growth was the precursor to the industrial revolutions that spread across the temperate world, from England in the mid-18th century to Japan in the late 19th century (World Bank, 2008).

The agrarian structures in Nepal are characterized by a very small land holding scattered to different plots, where irrigation is either not available or seasonal. For an agrarian economy such as Nepal, land ownership is the most important source of food security and household income as land being the important economic assets in the rural area. The average size of land owned by the household in Nepal is about 0.8 ha, which is frequently fragmented, averaging 3.3 parcels. Currently 3.3 million farm households in Nepal cultivate in 2.6 million hectares of lands, where a wide disparity exists in the distribution of land, with inequality of 0.544 as measured by the Gini Coefficient. According to the CBS (Agriculture Census) 2001, 47% of the land-owning households owned only 15% of the land with an average size less than 0.5 hectare, where as the top 5% owned nearly 37% of the land. About 75% of the farm households are having less than 1 hectare of land with very high labor to cultivable land ratio, low farm labor productivity, and low level of intensification. The small landholdings and their low productivity pose difficulties for many agriculture-based livelihoods in producing adequate foods and generating an adequate income and livelihoods.

Mushrooms are the members of higher fungi belonging to the class Basiodiomycetes and some are Ascomycetes. They are spore bearing fleshy organ of fungi and characterized by heterotrophic mode of nutrition (Aryal, 2008). Mushroom, an edible fungus, has been used as a food item since ancient times. It grows on decomposed organic matter and produce edible portion above the surface of the substrate. Out of large varieties of mushrooms, less than 25 species are accepted as

food and few of them have assumed commercial significance (Angle & Tamhane, 1974). Mushroom is a delicate fleshy fungus having high nutritional value. Mushrooms are saprophyte belonging to the lower plant group. Wild species often grow in the humus deposing during the rainy season being a temperature optimum (Hayes and Nair, 1974). Mushrooms are a special group of macroscopic fungi that lack chlorophyll and therefore, need substrate for their own absorptive nutrition. Mushrooms produce enzymes that degrade complex organic matter and absorb the soluble substances (Chang and Miles, 1989).

2.2 History of Mushroom Farming

The word mushroom is thought to be derived from the French word 'mousseron', 'mouse', or 'moss'. In Nepal it is known as 'Chyau' in Nepali while it is known by the name of 'kavak' or 'chhatrak' in Sanskrit (Adhikari, 2000). While in India, it is known as'khumbi' or 'kukurmutta' in Hindi (IFT, 1995).

Though mushroom is known to be consumed for time immortal by human beings, it is very difficult to know that when the mushroom consumption was started. Egyptians record legend showing belief that mushrooms were the plant of immortality and they prolonged the life and head aphrodisiac quality. This led Julius Caesar to issue and edict forbidding any of his troops other than captain of cuhorts to eat the plant. Epicures of Rome and the Royalty of France and Britain permitted only the courts and palaces to serve them. In addition, civilizations from many parts of the world, Central America, Mexico, China, Siberia, Greece and Russia all practiced mushroom ritual (Hayes and Nair, 1984). Past Roman writer Muselies said, “it is easy to reject gold or silver but difficult to reject mushroom plate without touch”. Also Roman king Niro decided to give huge prize for a poem of the mushroom. The oldest archaeological of mushroom use discovered so far is probably a Tassili image from a cave which dates back 3,500 years before the birth of Christ. Mushrooms with electrified auras are depicted outlining a dancing shaman. The spiritual interpretation of the image transcends time and is obvious. No wonder that word 'bemushroomed' has evolved to reflect the devout mushroom lover's state of mind (Paul, 1993). There are different views regarding the origin of the term 'mushroom'. In Latin 'fungi' means to flourish. It was a term which was used to refer to mushroom and to excrescencies from the ground or from trees. In Greek the term 'mushroom' was derived from the word 'sphoggos' which meant 'Spongo' and referred to the sponge like structure of some of the species (Bhal, 1994). The method of cultivation was recorded as early as 300 BC and then international cultivation was started as

early as 600 AD in China. Artificial cultivation of mushrooms was initiated in France around 1650 AD and rapidly spread to entire Europe continent as a garden crop. In the early years of 19th century, mushrooms were commercially cultivated inside the caves in France. According to experts, the mushroom consumption was first tried out by the Chinese. However, during the process of identifying the edible ones, hundreds of people died by the consumption of poisonous mushrooms (IFT, 1995).

2.3 Mushroom Cultivation in Nepal

In Nepal first exploration and collection of Nepalese fungi was carried out by J.D. Hooker (1848-1854) in eastern Nepal (Adhikari, 2000). In Nepal mushroom cultivation was initiated by the Division of Plant Pathology, Nepal Agricultural Research Council (NARC) in 1974. The growing technology for white button mushroom was developed during that early period and extended to general farmers starting in 1977. It utilized the synthetic media of paddy straw, which is harvested twice a year in Kathmandu. Of course, a few farmers grew mushrooms before the introduction of the technology but the number of button mushroom growers has increased year after year thanks to the spread of the technology. The growing technology to grow Oyster mushroom using chopped straw packets was introduced to the farmers in 1984, and since then mushroom cultivation has become more popular among farmers. These two kinds of mushroom cultivation systems have been employed by farmers in about 25 districts within Nepal.

Initially, cultivation technology was transferred in different locations in Kathmandu Valley like Balambu, Chapagaun, Harisiddhi, Koteshwor etc. and then to various places outside the Kathmandu Valley including Chitwan, Ilam, Sunsari, Jhapa, Dhankuta, Bara, Makawanpur, Nawalparasi, Pokhara, Mustang, Dang and Dhading district (Adhikari, 2000). Plant Pathology Division in NARC began distribution of spawn. Oyster mushroom was introduced to farmer in 1984. In the beginning a few numbers of farmers started. After successful production of oyster mushroom, the number of farmers increased to 50. At present there are about 5000-6000 mushroom farmers in Kathmandu alone (Department of Agriculture, 2015). The researches for other species started from 2001, by NARC as well as private organization Centre for Agriculture Technology (CAT) under Dr. Keshari Laxmi Manandhar and Agro Business Center (ABC) Kalimati.

Nepal is very rich in wild mushroom. Large varieties of mushroom are found in the forest due to varied climatic conditions and the topography of the country. Nepalese in general are habituated

to eat mushroom and occasional poisoning occurs. Introduction of mushroom cultivation was done by the Division of plant pathology, Khumaltar since 1974. However, only three types of mushroom viz. *Agaricus, Pleurotus,* and *Volvariella* have been grown in Nepal (Singh, 1998). A large number of mushrooms grow widely in Nepal under different climatic condition. So far, about 600 species of mushroom have been recorded but a lot of work still needs to be done in this regard. Among the valuable wild mushroom *Morchella, Catherella, Boletus, and Tricholoma* have been found in different districts (like Jumla, Humla, Rukum, Rolpa, Mugu) of Nepal. Every year, hundreds of kilograms of dry *Morchella* are exported to India and overseas. The mushroom *Agaricus bisporus* cultivation in Nepal was first initiated by the Division of plant pathology in 1974. Systemic cultivation of mushroom in Nepal was started by Mr. S.C. Singh, mycologist of Nepal in 1974/75 (Singh, 1998). The successful technology of *Pleurotus sajor* caju cultivation on chopped rice straw was transferred in the different seasons to various places in the country in 1983. Ultimately, an industry called Himalayan Agro Health Food Pvt. Ltd. was established in 1993 (Thapa, 1995). The Centre for Agricultural Technology (CAT) has recently introduced straw mushroom (*Volvoriella volvacea*) cultivation in the Terai districts and shiitake in the hill districts and has been instructing farmers how to grow them since 2001. Oyster mushrooms are often grown without any environmental control. *P. sajor* caju is cultivated for the summer crop at Kathmandu (25-30ºC and 80%RH) and in the hills of Nepal while it is cultivated in the Terai regions during the winter season (22-26ºC and 70%RH). *P. ostreatus* is grown during the winter season in Kathmandu and other cool places (5-20ºC and 70%RH). Oyster mushrooms cannot be grown in Terai during the summer (30-40ºC and 70%RH). The mid hills of Nepal are the most appropriate areas for Oyster mushroom production and therefore the mushroom technology has been expanded widely in those villages (Manandhar, 2004). The different species of mushroom are grown in different seasons at different altitudes of Nepal. The below table 2.1 shows the data for the different varieties of mushroom grown at different altitudes of Nepal.

Table 2.1 Altitude and time of cultivation of different varieties of mushroom

Region	Species	Season
High altitude(1400 m and above)	*Agaricus bisporus* *Pleurotussajor caju*	September to April March to October
Medium altitude (800 to 1400 m)	*Agaricus bisporus* *Pleurotussajor* caju *Volvariella volvacae*	September to February April to October June to August
Low altitude up to 800 m	*Agaricus bisporus* *Pleurotussajor* caju *Volvariella volvacae*	November to March December to February March to October

(Manandhar, 2004)

Nowadays, mushroom cultivation is being introduced as a popular program for income generation in development projects of government of Nepal, NGOs, and INGOs in different parts of the country. Oyster mushroom production is a most appropriate technology for the poor landless farmers and women farmers in Nepal. Mushrooms can be grown in the small space of farmer‟s own house for small scale production and generate income that aids in the family support. Mushroom cultivation is a most popular activity for development programs targeting income generation among women in Nepal because it is suitable for the women's life style (Manandhar, 2004).

The average production is about 8000-10000 kilogram per day (Adhikari, 2014). Pokhara and Chitwan are other major mushroom producers. Other districts also produce these but in very less amount, which is not enough to meet local demand. At present, most of the farmers started to produce the spawn and fruiting bodies of mushrooms (*Agaricus bisporus, Pleurotus ostreatus, Lentinula edodes, Lentinus sajor-caju* and *Ganoderma lucidum*) in commercial scale.

There are two seasons of cultivation of *Agaricus* mushroom. *Agaricus* harvested from Falgun to Baisakh, if spawn is inoculated in compost at Paush to Magh and *Agaricus*can be harvested from Ashwin to Magh if spawn is inoculated at the month of Ashad to Shrawn (Manandhar. 2004). The below table 2.2 shows main areas, where mushrooms cultivation is being done in Nepal.

Table 2.2 Areas of mushroom cultivation in Nepal

District	Area
Kathmandu	Balambu, Kakani,Thankot, Gokrna, Sundarijal, Budhanilkantha, Sankhu
Lalitpur	Chapagaun, Lamatar, Lakuri, Bhanjyang, Lele, Godawari
Bhaktapur	Sirutar, Balkot, Janagal
Kavre	Dhulikhel, Panauti, Nala
Chitwan	Padampur
Kaski	Pokhara

Farmers produce white bottom mushroom and oyster mushroom in tunnels made of bamboo framework and covered by plastic and straw, producing about 300-400kg in a season and 150-250 kg during an off season (Adhikari, 2014). The farmers choose mushroom farming because of the more profit within a short period of time. According to the farmers they could make profit up to 4 times their investment in average.

The crop production process involves six different steps *viz*., (1) spawn production, (2) substrate pretreatment, (3) mushroom bed preparation, (4) cropping room maintenance during spawn run and mushroom production, (5) harvesting and packaging, and (6) management of spent mushroom substrate. Farmers normally use milled paddy straw as substrate (2~4 cm) the milled straw is soaked in water for 4~5 hour, prior to hot water (80℃) or steaming treatment for 45~60 min. After pre-treatment, the materials are shade dried to get appropriate moisture condition (60~70%) before bed preparation. Polypropylene bags (60 × 30 cm) are normally used as containers for bed production and layer spawning with grain spawn is typically the adopted 12 technique. For spawn run, the bags are kept in clean rooms maintained at 25~30℃ and 80~85% humidity for 15~20 days. At this stage, steam-treated casing soil is applied on half-cut beds to a depth of 1.5~2.0 cm. The beds are then transferred to cropping rooms (polythene sheet covered rooms) maintained at 30~35℃, with humidity of higher than 80%. Sufficient natural light should be made available inside the cropping room. Pin heads will appear on the casing surface within a week and the mushrooms attain harvesting maturity in a couple of days. The first 12 flush of mushrooms will normally appear within 24~30 days of bed preparation. Over a period of 40~45 days, mushrooms could be harvested in three to four flushes (Singh, 1998).

2.4 Production and Marketing of Mushroom in World

The global mushroom production as per FAO Statistics was estimated at about 2.18 to 3.41 million tons over period of last ten years (1997-2007). Since there was an increase of about 56% world mushroom production in last decades and guesstimates can be put on current production to be around 3.5 million tons. China, USA, Netherlands, Poland, Spain, France, Italy, Ireland, Canada and UK are the leading producers. The three major mushroom producing countries as FAO data viz., China, USA, and Netherland account for more than 60% of the world production; however share of China itself is 46% which is about half of the world mushroom production. The major mushroom producing countries in the world are shown in below table 2.3.

Table 2.3 Major mushroom producing countries in tons in two different year

Countries	1997	2007
China	5,62,194	15,68,523
United States of America	3,66,810	3,59,630
Netherlands	2,40,000	2,40,000
Poland	1,00,000	1,60,000
Spain	81,304	1,40,000
France	1,73,000	1,25,000
Italy	57,646	85,900
Ireland	57,800	75,000
Canada	68,020	73,257
United Kingdom	1,07,359	72,000
Japan	74,782	67,000
Germany	60,000	55,000
Indonesia	19,000	48,247
India	9,000	48,000
Belgium	NA	43,000
Australia	35,485	42,739
Korea	13,181	28,764
Iran	10,000	28,000
Hungary	13,559	21,200
Vietnam	10,000	18,000
Denmark	8,766	11,000
Thailand	9,000	10,000
Israel	1,260	9,500
South Africa	7,460	9,395
New Zealand	7,500	8,500

Switzerland	7,239	7,440
Other Countries	85,911	59,297
Total World Production	21,86,222	3,414,392

Source World mushroom & truffles: Production, 1961-2007; United Nations, FAO Stat (8/28/2009).

Considering that 95% of mushroom production in China is consumed locally, the consumption per capita is likely to be over 10 kg/person/year. This is drastically higher than in US and many European countries where it is around 3 kg/person/year. World mushroom production (FAO Stat) is continuously increasing from 0.30 to 3.41 million tons over period of about last 50 years from 1961 to 2010. Also the export and import trend lines shows that the mushroom export/import has continuously increased in last 40 years, but marginally up to 1985 and beyond it there is tremendous increase in mushroom export/ import up to 2010. Poland, Netherland, Ireland, China, Belgium, Lithuania, Canada and USA are the major mushroom exporting countries while countries like UK, Germany, France, Netherland, Belgium, Russian Federation and Japan import the mushroom from above said exporting countries (FAO, 2009).

2.5 Varieties of Mushroom

2.5.1 Edible Varieties

There are around 38,000 mushroom varieties known to exist, however about 100 of them are considered to be edible. Of the edible varieties, the most popular ones are the *Agaricus bisporus* (the European or white button mushroom), *Lentinus edodus (Shitake) or* Japanese mushroom, P*leurotus* spp like *Pleurotus ostreaus* (American Oyster mushroom)and the *Pleurotus sajor* caju (*dhingri* or Indian Oyster mushroom), *Volvariella volvacae* (the Chinese or paddy straw mushroom) (IFT, 1995).

2.5.2 Inedible Varieties

Among thousands of mushroom species fewer than a hundred are toxic. Most fungal toxins cause mild or moderate poisoning. It is, however, the ingestion of a few species of extremely poisonous fungi that define the medical dimension of the problem. Mushroom poisoning is mostly accidental and the result of a mix-up between edible and toxic fungi, but intentional ingestion of psychotropic (magic) mushrooms is also a problem **(**Beck and Helander, 1998). The most dreaded poisonings are those caused by cytotoxic agents e.g. amatoxins in death cap and destroying angel (severe gastroenteritis and liver damage) or orellanine in *Cortinarius* spp. (kidney damage).

Dramatic, but rarely lethal, effects are caused by fungi-holding neurotoxins like muscarine (*Clitocybe* and *Inocybe* spp.), psilocybin (*Psilocybe* and *Panaeolus* spp., „magic" mushrooms), isoxazoles (fly agaric and panther cap) and gyromitrin (false morels). Many poisonous species cause gastroenteritis only (Resinsky and Besl, 1990).

2.6 Nutritional Value of Mushroom

Normally mushrooms contain from 20-40% proteins on dry basis and thus surpass many foods, in terms of protein content. The proteins of mushroom are of high quality and rich in various amino acids (Crisian and sands, 1978). Crisian and sands (1978) have reported that mushrooms contain more proteins than other vegetables. Even the available vegetables proteins up to 70-90% in fresh mushroom can be digested. Mushroom have low carbohydrate content, no cholesterol and are almost fat free (0.2g/100g). Therefore, they form an important constituent for a balanced diet.

According to FAO (1974), mushrooms are edible fungi of commercial importance and their cultivation and consumption have increased substantially due to their nutritional value, delicacy and flavor. It is rich in vitamins C, D, B, and Mg, P, Ca, dietary fibers and amino acids. Another important ingredient of mushroom is the polysaccharide compound beta-glucan, which enhances cellular immune function. Mushroom protein can serve as food contributing protein in developing countries, where the population mainly depends on cereal based foods. The Oyster mushrooms are rich in protein, minerals, devoid of starch or low in calories and carbohydrates. These are ideal food for diabetic and heart patient and those who do not want to put on weight (FAO, 1974).

2.7 Medicinal Value of Mushroom

With regards to health benefits and medicinal value, edible fungi produce secondary metabolites, which are biologically active. These secondary metabolites get stored in the fruit bodies of the edible fungi which possesses various therapeutic properties. *Lentinuts edodes* has been shown to have anti-tumor, anti-viral, and hypolipidemic agents (Moore *et al.*, 1985). The hypolipidemic and the hypocholesterolemic properties are due to eritadiene (2,3 dihydroxy-4-9 adenyl) and butyric acid. The anti-tumor properties are due to the polysaccharides lentinans and emitanin (Chihara, *et al.*, 1970). In addition to anti-tumor, anti-cholesterol, and anti-thromobic effects of mushrooms, *shiitake* mushroom can help in preventing high blood pressure, atherosclerosis, kidney, ailments, diabetes, cataract, neuralgia, gallstone, numbness of hand and feet, hemorrhoids and also improves sexual powers (Mori, 1974). Protein containing polysaccharides containing anti-tumor activity were reported from *Pleurotus sajor caju* by Zhaung *et al.*, (1993). It is quite

useful to prevent high blood pressure, diabetes, bleeding, breast and lungs disease, jaundice, intestinal worm infections, throat diseases. It also contains lecithin which helps to keep the cholesterol down and enzyme trypsin which is valuable aid to digestion. Clinical extracts of L-edodes which shows anti-AIDS property are also being carried out in USA. Additionally it has been found that the mushroom contain retine, so can prevent the growth of tumor and cancer both of which are caused by the lack of retine generally (IFT, 1995). Mushrooms are an excellent source of potassium, a mineral that helps lower elevated blood pressure and reduces the risk of stroke. One medium portabella mushroom has even more potassium than a banana or a glass of orange juice. One serving of mushrooms also provides about 20 to 40% of the daily value of copper, a mineral that has cardioprotective properties (Craig, 2003).

2.8 Advantages of Mushroom Cultivation

Since mushroom cultivation can be a labour-intensive agro-industrial activity, it could have great economic and social impact by generating income and employment for both women and youth, particularly in rural areas in developing countries. Using China as an example, in 1978 the total production of mushrooms in China was only 60,000 tones, which accounted for less than 6 percent of total world mushroom production. In 2006, however, total production of mushrooms in China reached 14 million tonnes and accounted for over 70 per cent of total world mushroom production. According to recent statistics, in 2006 the value of total mushroom production in China was US$6 billion and the export value of mushrooms was US$ 1.1billion. It is estimated that in 2007, the export value of mushrooms is US$1.4billion and it is expected to grow to US$1.6billion in 2008. Total employment in the mushroom industry in China was over 30 million people in 2006, with only 10 percent of the employed being actual mushroom farmers, other employment fall within sectors such as food, beverage manufacturing, trading and management, transport, marketing, wholesaling, retailing, export etc. The mushroom industry can also have even broader positive spill-over, generating complementary employment in areas such as accommodation, restaurant services etc. Further, it is interesting to note that in some counties in China with a population of just under 200,000 people, 60 per cent of the population were engaged in mushroom production and management. The local mushroom industry can also be the main source of revenue for local government. Mushroom cultivation has great scope in China, India and in some of other developing countries because of the cheap and easily available raw materials needed for this activity, coupled with faster means of communication and marketing (as a fresh

commodity), and better purchasing power of the people. It is hoped that the avocation of mushroom farming will become a very important cottage industry activity in the integrated rural development programme, which will lead to the economic betterment of not only small farmers but also of landless laborers and other weak sections of communities (UN economic and social commission for asia and the pacific). The advantages of mushroom cultivation can be summarized as:

1. Wastes such as cereal straws are largely burnt by the farmers, which causes air pollution. However, these raw materials can actually be used for the cultivation of mushrooms. This kind of bioconversion exercise can greatly reduce environmental pollution.
2. Mushroom cultivation can be a labour intensive activity. Therefore, it will serve as means of generating employment, particularly for rural women and youths in order to raise their social status. It will also provide additional work for the farmers during winter months when the farming schedule is light.
3. It will provide the people with an additional vegetable of high quality, and enrich the diet with high quality proteins, minerals and vitamins which can be of direct benefit to the human health and fitness. The extractable bioactive compounds from medicinal mushrooms would enhance human's immune systems and improve their quality of life.
4. Mushroom cultivation is a cash crop. The harvested fruiting bodies can be sold in local markets for additional family income or exported for an important source of foreign exchange that will definitely improve the economic standards of the people.
5. Some warm mushrooms, e.g. Volvariella volvacea (Straw mushrooms) and Pleurotus sajor-caju (Oyster mushrooms) are relatively fast growing organisms and can be harvested in 3 to 4 weeks after spawning. It is a short return agricultural business and can be of immediate benefit to the community.
6. While land availability is usually a limiting factor in most types of primary production, mushroom cultivation requires relatively little space. Actually they can be stacked using shelf like culture systems.

2.9 Mushroom Cultivation Technology

Mushrooms can be cultivated through a variety of methods. Some methods are extremely simple and demand little or no technical expertise. On the other hand, cultivations which require aspects of sterile handling technology are much more technically demanding.

Oyster mushroom (*Pleurotus* spp.*)* cultivation has increased tremendously throughout the world during the last few decades. Oyster mushroom accounted for 14.2 % of the total world production of edible mushroom in 1997 (Chang, 1999).

Mushroom farming is a complex business, which requires precision. Indeed, it is not as simple as what some people often loosely stipulate. It calls for adherence to precise procedures. The major practical steps/segments of mushroom cultivation are: (a) selection of an acceptable mushroom species; (b) secreting a good quality fruiting culture; (c) development of robust spawn; (d) preparation of selective substrate/compost; (e) care of mycelial (spawn) running; (f) management of fruiting/ mushroom development; and (g) harvesting mushrooms carefully (Chang 1999). If you ignore one critical step/segment, you are inviting trouble, which could lead to a substantially reduced mushroom crop yield and mushroom marketing value.

a) Selection of Acceptable Mushroom Species/Strains

   Before any decision to cultivate a particular mushroom is made, it is important to determine if that species possess organoleptic qualities acceptable to the indigenous population or to the international market, if suitable substrates for cultivation are plentiful, and if environmental requirements for growth and fruiting can be met without excessively costly systems of mechanical control.

b) Secreting a Good Quality Fruiting Culture

   A fruiting culture is defined as a culture with the genetic capacity to form fruiting bodies under suitable growth conditions. The stock culture which is selected should be acceptable in terms of yield, flavour, texture, fruiting time, etc.

c) Development of Robust Spawn

A medium through which the mycelium of a fruiting culture has grown and which serves as the inoculum of seed for the substrate in mushroom cultivation is called the mushroom spawn. Failure to achieve a satisfactory harvest may often be traced to unsatisfactory spawn used. Consideration must also be given to the nature of the spawn substrate since this influences rapidity of growth in the spawn medium as well as the rate of mycelial growth and filling of the beds following inoculation.

d) Preparation of Selective Substrate/Compost

While a sterile substrate free from all competitive micro-organisms is the ideal medium for cultivating edible mushrooms, systems involving such strict hygiene are generally too costly and

impractical to operate on a large scale. Substrates for cultivating edible mushrooms normally require varying degrees of pre-treatment in order to promote growth of the mushroom mycelium to the practical exclusion of other micro-organisms. The substrate must be rich in essential nutrients in forms which are readily available to the mushroom, and be free of toxic substances which inhibit growth of the spawn. Moisture content, pH and good gaseous exchange between the substrate and the surrounding environment are important physical factors to consider.

Mushroom substrate may be simply defined as a kind of lignocellulosic material which supports the growth, development, and fruiting of mushroom mycelium. The process of preparation of substrate is broadly termed composting. The final product of composting is called the compost or prepared substrate. The process for preparation of substrates has been the subject of much scientific and practical interest over the past two decades. It should be noted that different types of mushrooms require different types or substrate/compost. Agaricus bisporus grows on fermented compost which is traditionally developed from wheat straw mixed with horse manure, and it requires higher nitrogen content. Wheat straw contains about 0.62% nitrogen, and horse manure contains about 1.5 to 1.8% nitrogen. The optimum C:N (carbon:nitrogen) ratio for the mushroom is about 17 to 1 for mycelial running. Volvariella volvacea, the paddy straw mushroom, and Stropharia rugosoannulata are grown on almost raw or less composted plant residues, such as rice straw and cotton waste materials. These cellulosic plant materials contain different amounts of nitrogen: rice straw 0.58%, cotton waste 0.65 to 1%, and banana leaves 1.71%. It should be understood that V. volvacea is capable of growing on plant material with low nitrogen content. The optimum C:N ratio is about 75 to 80:1, but C:N ratios from 32 to 150:1 are almost as effective. Lentinula edodes and Pleurotus spp. are fungi that can grow on wood. In addition to being distinguished by its high lignin content, wood can also be distinguished from other plant materials by its very low nitrogen content. Woody tissues contain 0.03 to 1.0% nitrogen as compared to 0.85 to 1.71% in herbaceous residues. The C:N ratio in most woody tissues is in the order of 350 to 500:1. Woodinhabiting mushrooms are unique in that they can grow in such substrates. This suggests that these mushrooms can metabolise large amounts of carbohydrates, including lignin, in the presence of a very small amount of nitrogen.

e) Care of Mycelial (Spawn) Running

f) Following composting, the substrate is placed in beds where it is generally pasteurized by steam to kill off potential competitive microorganisms. After the compost has cooled, the

spawn may be broadcast over the bed surface and then pressed down firmly against the substrate to ensure good contact, or inserted 2 to 2.5 cm deep into the substrate. Spawn running is the phase during which mycelium grows from the spawn and permeates into the substrate. Good mycelial growth is essential for mushroom production.

g) Management of Fruiting/Mushroom Development

Under suitable environmental conditions, which may differ from those adopted for spawn running, primordial formation occurs and then followed by the production of fruiting bodies. The appearance of mushrooms normally occurs in rhythmic cycles called flushes.

h) Harvesting Mushrooms Carefully

Harvesting is carried out at different maturation stages depending upon the species and upon consumer preferences and market value.

Fig 2.1 *Agaricus Bisporus* Button mushrooms grown on horse manure compos

Fig 2.2 *Lentinula edodes* (Shiitake) grown on sawdust synthetic logs

Fig 2.3 *Pleurotus* spp. (Oyster) mushroom

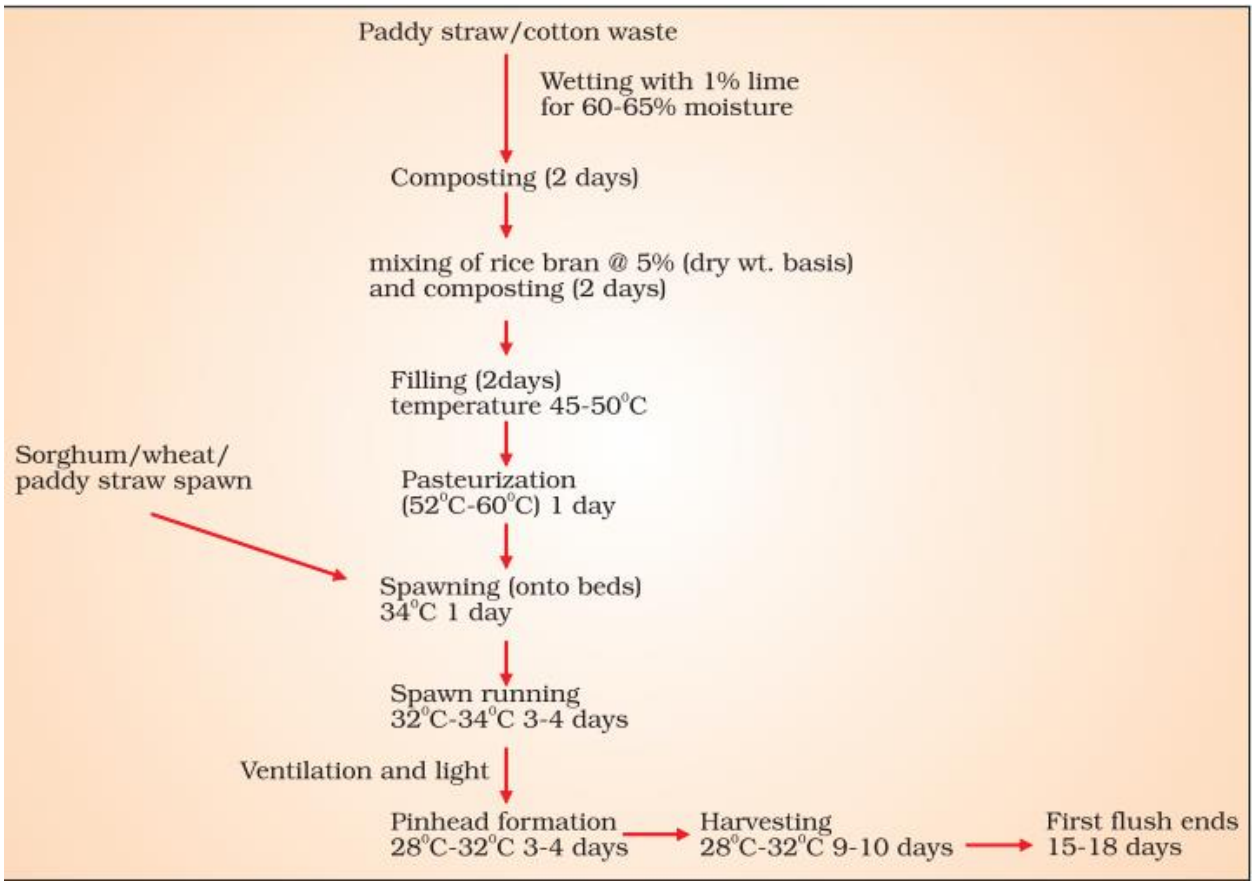


Fig 2.4 Indoor method of paddy straw mushroom cultivation (Tewari et al, 2007)

2.10 Socio-Economic Impact of Mushroom Farming

Kapoor *et al*. (1987) conducted a case study on economics of button mushroom cultivation in Himachal Pradesh and observed the commercial cultivation of the button mushroom (*Agaricus bisporus*) has only recently been started in Himanchal Pradesh (HP). As a result of promotional efforts by UNDP/FAO/HP Government, many small farmers are now talking up mushroom cultivation. The main centres of cultivation are Solan and Shimla districts, with 90 per cent of the registered growers. The case study concludes that there is great scope for taking up mushroom cultivation under natural environmental conditions in Himachal Pradesh and similar other hilly regions of India. It can provide off-season employment for farm families and also augment their incomes if adopted as a subsidiary occupation. As a full time business, it can generate an income equivalent to 175 per cent of the income earned by a trained graduate teacher, if more than 200 superscript to area is cultivated at least three times a year.

Vijaya Khader (1994) examined the effect of mushroom cultivation on the development of rural women's entrepreneurship in India. Spawn multiplication and oyster mushroom cultivation at the household level were examined in terms of their feasibility as an income generating activity at the household level and to assess women's attitudes towards mushroom cultivation. Results indicate that the initial non-recurrent expenditure was high for women for low income groups, although this could be reduced if women could share this. Net incomes vary and depend on the sale price of the spawn prepared by the entrepreneur. The costs of cultivation are increasing profit levels. After adequate training and demonstration, respondents have shown a much more positive attitude towards mushroom cultivation. Spawn multiplication can be done by women as a cooperative venture and mushroom cultivation can be undertaken at the household level as an income generating activity.

Singh *et al*. (2003) determined the socio-economic characteristics of 100 mushroom growers in Sonepat district, Haryana, India. It is revealed that most of the growers belong to the middle-aged group (35-50 years), are literate, with an average land holding of less than 5 acres. Most of the growers have a low socio-economic status and have poor extension contact and mass media exposure.

Oseni (2007) examined the study on the economics of mushroom marketing as a strategy for reducing poverty in Ondo state, Nigeria. The study revealed that majority of the mushroom marketers are females (72%). Mushroom marketing in the area is mostly done on a retail basis,

with marketing activities undertaken mostly on a daily basis as collaborated by 94% of the respondents. There is a considerably high level of formal education among marketers as majority attained at least senior school education but most have low marketing experience. The gross margin analysis revealed that mushroom marketing is profitable in the study area. An average gross margin of 73,459.00 naira was realized per marketer per season. Regression analysis showed that there is a significant relationship between net monthly profit of marketers and degree of involvement, transport costs, price of an quantity of mushroom sold.

Sharma *et al*. (2007) studied the role of women in mushroom cultivation in Sonepat district of Haryana and found that mushroom growing has been appreciated as a technically feasible and highly profitable venture. Women play an important role in mushroom cultivation especially in picking, grading and packing of mushroom. The study revealed that the net return, net return per month, benefit- cost ratio and net return per kg of mushroom, production increases with the increase in size of farm. The large farms were found to be most economic and efficient size of mushroom, production unit under the existing resource use scenario. Females were major contributors in mushroom cultivation. The proportionate contribution of wife alone was found higher than the husband on all size groups of farms.

Sabita Mishra (2008) imparted training on mushroom cultivation with 100 farm women of Pipili block of Khurda district of Orissa to know the socio-economic development after mushroom cultivation, constraints faced by them and future suggestions. The study revealed that 70 per cent of women mushroom growers had improved their occupation followed by improvement in ‘standard of living (36%), better saving (30%), knowledge and attitude, (24%) and social status (10%). As perceived by the farm women, they face the maximum constraints in value added items and least problem in lack of awareness in mushroom cultivation, sixty per cent of the respondents stated that lack of quality supply of spawn bottle, practical manual for cultivation and insurance were the three major constraints for successful mushroom entrepreneurship.

Singh *et al* (2008) studied the constraints in mushroom production technology in Haryana and found that particularly small and marginal farmers are showing interest in adopting mushroom cultivation. In addition to its high profitability, the unemployed youths, housewives and farmers are attracted towards this enterprise because the space required for mushroom cultivation is available even at home and the surplus manpower of a family owning mushroom unit can be judiciously utilized. The state department of Horticulture and Krishi Vigyan Kendra are playing a

major role for popularization of this enterprise. Inspite of all efforts, there are number of problems encountered by the mushroom growers in its cultivation. The major constraints in mushroom production technology were found to be the fluctuating price prevailing in the market, lack of cold storage and non-availability of drawing equipments (100%), lack of information about marketing (90.00%), lack of finance (84.66%), and lack of transportation facilities (76.36%), inadequate knowledge about mushroom production technology (70.00%) and non-availability of spawn (69.72%).

Khare *et al*. (2009) assesses the role of mushroom production by farm women in augmenting income and food security in seven districts of Chhattisgarh and observed that majority of respondents have low socio-economic status and spend about 58% of their income on food and clothing. They further observed that majority of the respondent produced oyster mushroom followed by paddy straw mushroom with more than 100 kg annual production. The cost of mushroom production is mostly up to Rs. 15/kg and they sell their produce at Rs 35 to 45 per gram. A good majority of respondents consume mushroom in their diet and mushroom growing provides more than Rs 4000 in a season.

Jab and Geetha (2010) analysed the economics of oyster mushroom cultivation in Kerala and indicated that mushroom cultivation can be undertaken as an agri-business and is an ideal enterprise for house wives to earn an additional income. The major contributor of working capital was the material input (78%) and the rest by hired labour. Explicit costs increased as the size of the operation increased, while implicit cost showed a decreasing trend. Low yield due to incidence of pests and diseases was the most important production constraint followed by high price of inputs and low yield due to seasonal variation. Major marketing problem was lack of awareness about the importance and nutritional qualities of mushrooms.

CHAPTER – III: RESEARCH METHODOLOGY

3.1 Research Design

Methodology is a useful bridge to solve the research problem in systematic way. It describes the methods and process applied to the entire aspect of the study. In other words, methodology is the way to gather information. Different tools and techniques are used in different phase of this study. Thus the framework of methodology contains population, sample, instrument, data collection procedure and data analysis procedure. A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems. The plan is the complete scheme or programme of the research. It includes an outline of what the investigator do from writing the hypotheses and their operational implications to the final analysis of data.

The research is a complete analysis on the basis of available primary and secondary documents on the subject matter. The research is conducted on the basis of review of available literatures.

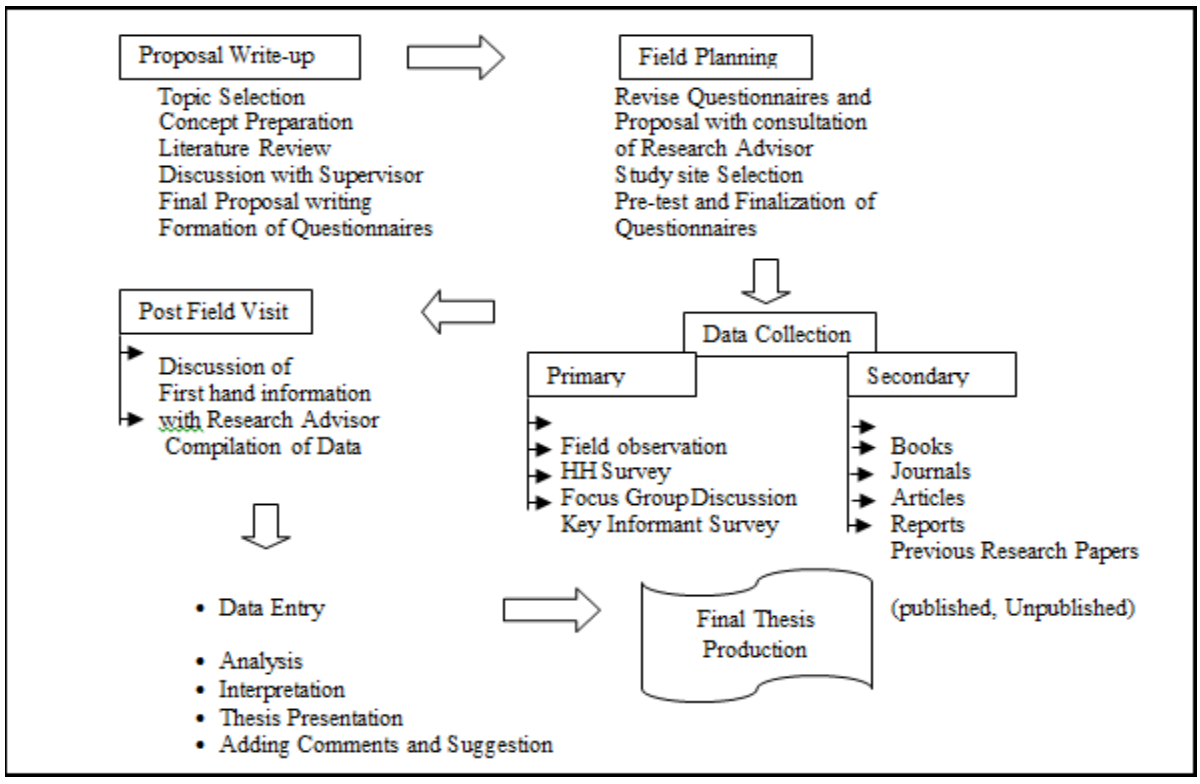


Figure 3.1 Overall Research Process

3.2 Selection of Study Area

Kalika is a municipality in Chitwan District in the Narayani Zone of southern Nepal. This municipality was established on 2015 AD by merging the existing Jutpani, Padampur, Shaktikhor and Siddhi VDCs. Kalika municipality (Padampur) is situated in Chitwan district having the Latitude: 27° 32' 41.5" (27.5449°) north. Also the Longitude: 84° 30' 54.4" (84.5151°) east and Elevation: 189 meters (620 feet) (mapcarta.com).

It is a rural side of the district. Most of the people are engaged in agriculture here and also some of them are in service sector. People are involved in traditional agriculture mostly cereals only and also due to lack of efficient manpower they hardly switch their occupation to the next modern technology. Nowadays trend has been changed and people are being switched from traditional cereal crops to cash crops like mushroom.

3.3 Population, Sampling Size and Sampling Methods

Data need assessment indicates the data required for conducting the study. It is entirely the function of objectives and conceptual framework of the study and depends primarily on hypothesis (qualitative and quantitative) to be tested under the study. This is a descriptive research which employs both qualitative and quantitative data from primary and secondary sources. The research design entails different types of data and involves assorted method and techniques to collect the required information. It ensures that the findings and analyzed explanations can be the subject of analysis and used for comparisons.

On the basis of preliminary information available from the district agriculture profile and municipality profile, a total of 107 households were selected randomly through simple random sampling method.

(i) A total of 50 households were selected using simple random sampling method for questionnaire and checklist survey. Purposive sampling method was used for key informant survey and focus group discussions.

(ii) The households selected were then interviewed using a set of pre-structured questionnaire prepared by the researcher basing on the objectives of the study.

3.4 Sources and Data and Collection Techniques

Data was obtained from both the primary and secondary sources using qualitative and quantitative data collection techniques and tools. Both Primary and secondary data has been considered of equal importance while gathering the relevant information.

3.4.1 Primary Data Collection

Primary data in the study refers to the data collected by the researcher, it is the firsthand data collected by the researcher. It was collected by the researcher after gaining some insight into the issue by reviewing secondary research or by analyzing previously collected primary data. In this study primary data was primarily collected through household survey using a set of pre structured questionnaire developed by the researcher. A sample of around 107 households was purposively selected. A set of structured questionnaire and checklist were prepared which was used for generating the required information. Informal talks and participatory assessment were carried out to check the efficiency of the formal method being employed. Various other methods of primary data collection like observation, interview (personal face to face communication and telephone survey, questionnaires, checklist and schedules consisting of both close and open ended questions along with written instruction was used to gather the required information). Other participatory techniques like FGD and KIS were also used as sources of primary information.

i. Household survey

The household survey will be conducted in as much as possible no. of households using structural and semi-structural questionnaire. The basic quantitative information such as age, sex, educational attainment, land holding size, occupation other than farming, health and hygiene of the households are gathered through household survey.

ii. Observation

Observation method will be used to collect key information. Socio-economic activities will be observed by participant observation. Similarly, housing, sanitation, occupation etc. will be observed.

iii. Key information interview

Selected informative persons who could give information about the defined mushroom farming will be asked in order to gather the information. Persons like filed owner, field worker, local society and other stake holders will be included for the same.

3.4.2 Secondary Data Collection

Secondary data in the study refers to the data collected by the researcher from various published and unpublished Sources. Common sources of secondary data included censuses, organizational records and data collected through qualitative methods or qualitative research, published and non-published documents, reports, articles, book, magazine, newspapers, encyclopedia, indexes bibliography, publications, thesis, journals, abstracts, statistics and historical documents and journals.

Both qualitative and quantitative data collection methods were considered of equal importance during the process of data collection. Literatures, facts and findings published by both Government and non-government organizations working in the field of agriculture, land and development was reviewed for gathering the required information. Relevant Government institutions like municipality, CBS and non- government organizations like ICIMOD.

The data obtained from these sources were indispensable in conducting reviews and to find out relevant literatures based on similar type of studies and exacerbate the ideas and concepts to analyze that with the reality of primary data generated in the study. Information, facts and figures derived from the secondary sources were used to support and critically verify and supplement the information inferred in the findings of this study.

3.4.3 Reliability and Validity

The information collected from field survey was reliable and valid because the researcher has collected all the data without using any external associate. The researcher had prepared and conducted all interview in the local language to avoid ambiguities. No biasness was involved. Question and answers were clear during interviews and discussions. This helped in attesting full accuracy of the information generated from field survey. It was ensured that no disturbances during interviews and discussion sessions occurred thereby ensuring that the respondents were free to express their thoughts and ideas.

Key informant's survey and focus group discussions were considered as the two basic methods to validate the information collected from household interviews and vice versa. Some of the information collected from KI and FGD were validated during household interviews and observations.

3.4.4 Analysis and Presentation of Data

Data after collection has been edited, processed and analyzed. Structured questionnaires check list and notes used during interviews and discussions on completion were reviewed to check the inconsistencies in facts and figures. Edited questionnaires were then coded and entered into the computer software simply designed by the researcher. Some information were analyzed manually. Simple statistical tools such as mean, percentage, frequency, pie-chart, graph, trend analysis and bar diagrams was employed during the process. The analysis was performed through cross tabulation in order to explore the relation between different variables. Qualitative data have been checked through focus group discussions, accidental interview and key informant survey. Valuable points, issues and statements were then selected from the qualitative data to supplement and complement other data sources to draw conclusions and recommendations.

Presentation of information in this study was based on a descriptive analysis supported by household based responses tabulated and quantified for simple presentation in tables, charts and graphs and figures and discussions were based on cross verified between the variables from each of the frequencies and critically reviewed documents.

CHAPTER –IV: DATA ANALYSIS AND INTERPRETATION

4.1 An Introduction to the Study Area

Kalika municipality (Padampur) is situated in Chitwan district having the Latitude: 27° 32' 41.5" (27.5449°) north. Also the Longitude: 84° 30' 54.4" (84.5151°) east and Elevation: 189 meters (620 feet) (mapcarta.com).

There are 3231 no. of HHs with 7104 no. of male and 7820 no. of female i.e. 14924 is the total population of the previous Padampur VDC. Source: Central Bureau of Statistics, National Census, 2068).

4.2 Socio-Economic Status of Mushroom Growers

Socio-economic characteristics of the mushroom cultivator are important to study for finding out their technique, present status of cost and benefit and problem and prospects. The socioeconomic characteristics of the respondents was analyzed and interpreted in terms of their caste, sex, age, marital status, educational status and so on. The detail of it is discussed in following section.

4.2.1 Respondents by Age

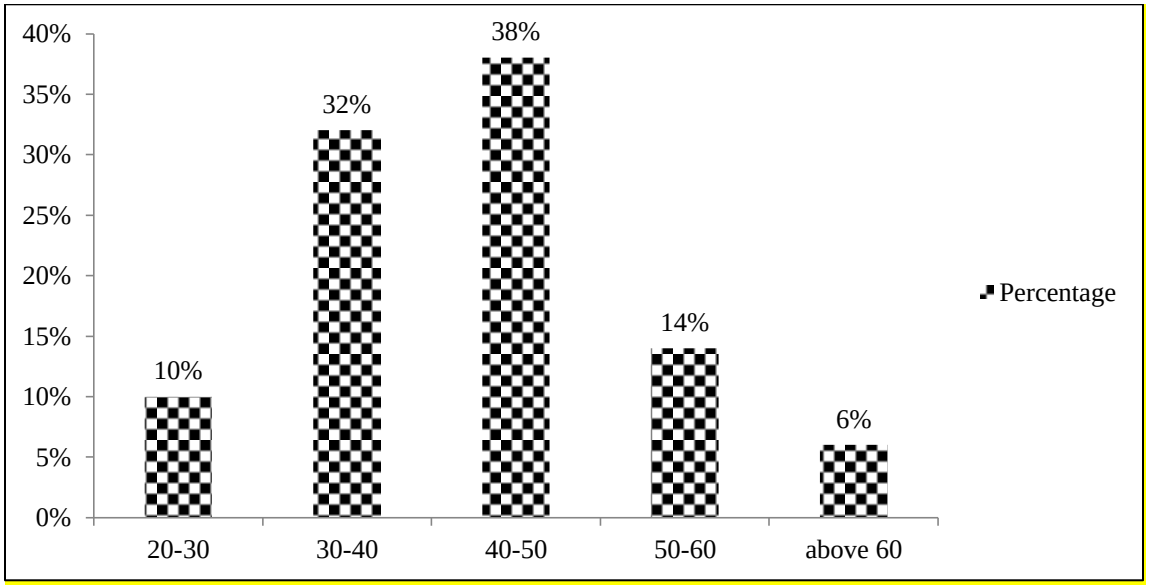
Age is considered as an important socio-economic factor which influences the decision making capacity of human being. Age also gives an idea with respect to the earning capacity of a person. Hence, the present study has been undertaken to have an idea about the age pattern of mushroom grower's family head in the study area which have been presented in Table 4.1.

Table 4.1 Responded by Age

S.N.	Age Group	No. of household	Percentage
1	20-30	5	10
2	30-40	16	32
3	40-50	19	38
4	50-60	7	14
5	Above 60	3	6
Total		50	100

Source: Field Survey, 2019

As presented in the above table, 38% of the 50 HHs belong to age group 40-50. Similarly, 32% and 14% were belonging to 30-40 and 50-60 age group respectively. Whereas, only 10% HHs were belonging to 20-30 and 6% belonging to above 60 as shown in below graph. Young people have comparatively less interest to engage themselves in mushroom cultivation. In this age their inclination is for career building and searching better opportunities.



4.2.2 Respondents by Family Size

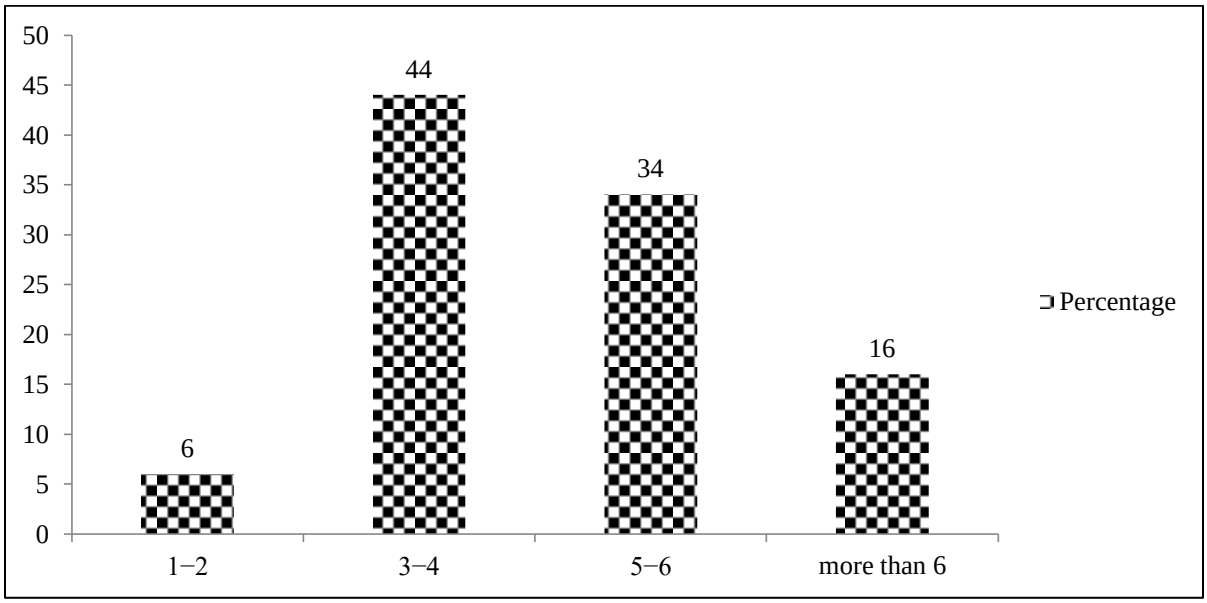
Family size is one of the important social factors which affects the type of activity as well as the decision making process of the family. Size of the family largely affects the economic behavior of the family, particularly relating to the income and expenditure.

Table 4.2 Responded by Family size

S.N.	Family size (no. of member)	No. of household	Percentage
1	1-2	3	6
2	3-4	22	44
3	5-6	17	34
4	More than 6	8	16
Total		50	100

Source: Field Survey, 2019

As presented in the above tables, 44% of the 50 HHs have family members 3-4. Similarly, 16% and 34% were for HHs having family members more than 6 and 5-6 respectively. Whereas, the least i.e. only 6% HHs have 1-2 family members they were mostly father and mother, since their children had gone abroad or other cities for education or employment.



4.2.3 Education of the Respondents

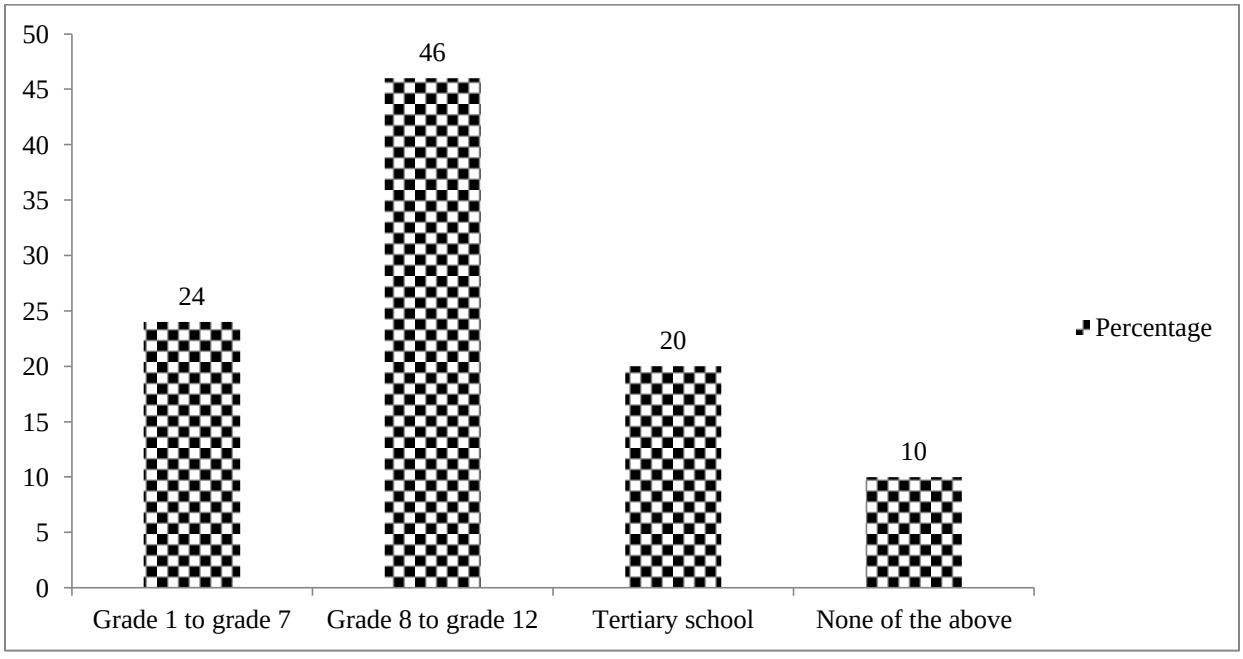
Education is one of the important factors which act a catalyst in the process of human resource development. The educated person is expected to adopt agricultural technology more precisely and respond to make a change the agricultural production process more rationally. Due to better understanding of literate person, it is expected that they are likely to get comparatively more employment than uneducated/illiterate persons. Moreover, various studies revealed that literate persons are likely to get comparatively less employment than illiterate persons in agricultural section. These studies also indicated that the literate and educated laborers used to withdraw themselves from agricultural operations and they are more eager to get employment in non-farm sector. Keeping in view the above contradictory observations and concept, the present study has been undertaken to examine the literacy level of mushroom growers in the study area which have been presented in Table 4.3.

Table 4.3 Educational status of the respondents

S.N.	Education level	No. of respondents	Percentage
1	Grade 1 to grade 7	12	24
2	Grade 8 to grade 12	23	46
3	Tertiary School	10	20
4	None of the above	5	10
Total		50	100

Source: Field Survey, 2019

In the study of mushroom farming in Kalika, out of 50 HHs sampled, the respondent who completed grade 1 to grade 7 education level was found to be 24%. Similarly, for grade 8 to grade 12 and tertiary school were found to be 46% and 20% respectively. Also those respondents who had taken special education were found to be 10%. All the calculation is based upon the primary data collected during field survey.



4.2.4 Sources of Income Generation for Respondents

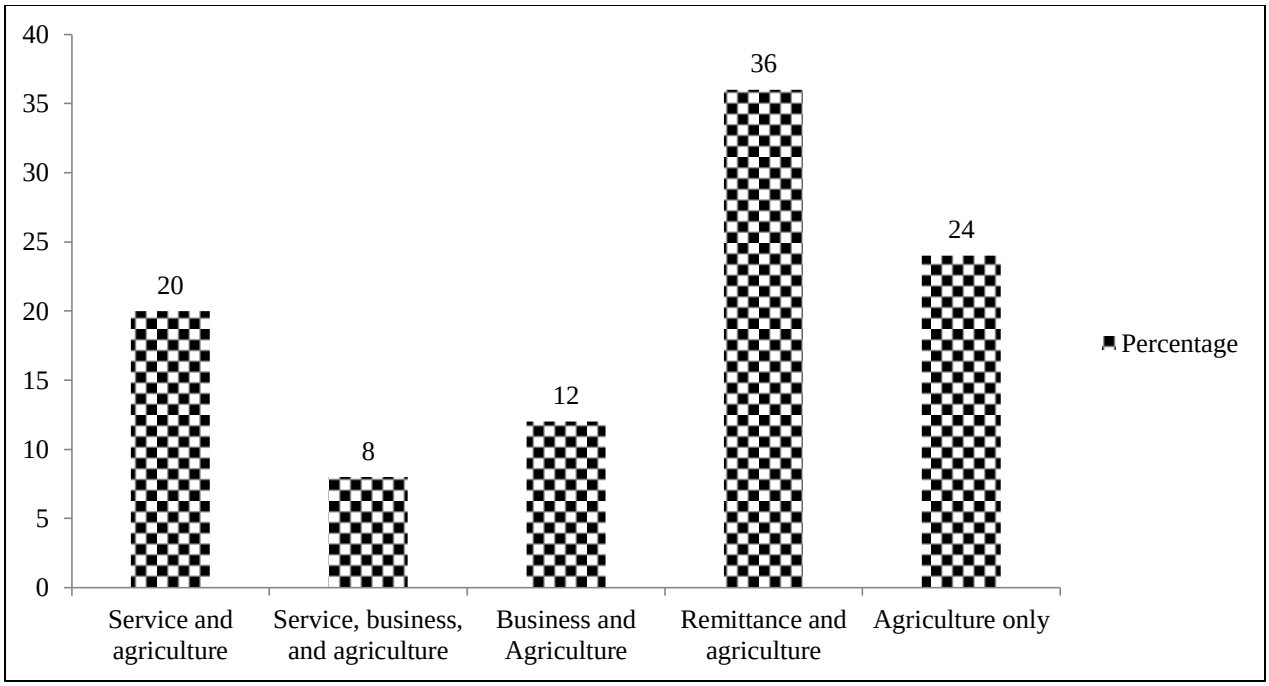
Primarily occupation is the key factor to determine the income status then later for education, health facility. Occupation may be different types. In Nepalese society, so called government job holders and the other are respectable than the people who engaged in the agriculture sector. But, the scenario has been changing and income generation sources are also being changed. People are not focusing only on jobs rather they are also being involved in business as well as modern agriculture technology. Animal and poultry farming are the best example in our society now.

Table 4.4 Income sources pattern of respondents

S.N.	Sources	No. of HHs	Percentage
1	Service and agriculture	10	20
2	Service, business, and agriculture	4	8
3	Business and Agriculture	6	12
4	Remittance and agriculture	18	36
5	Agriculture only	12	24
Total		50	100

Source: Field Survey, 2019

It is observed that 20 % people are generating their income through service and agriculture. Similarly, for other income generating sources viz; a) service, business & agriculture, b) business and agriculture, c) remittance and agriculture, and d) agriculture alone were found to be 8%, 12%, 36% and 24% respectively. From the graphs mentioned, it can concluded that major income source is remittance and in all the income sources agriculture is part of them for all the respondents involved in mushroom faming.



4.2.5 Land Holding Size

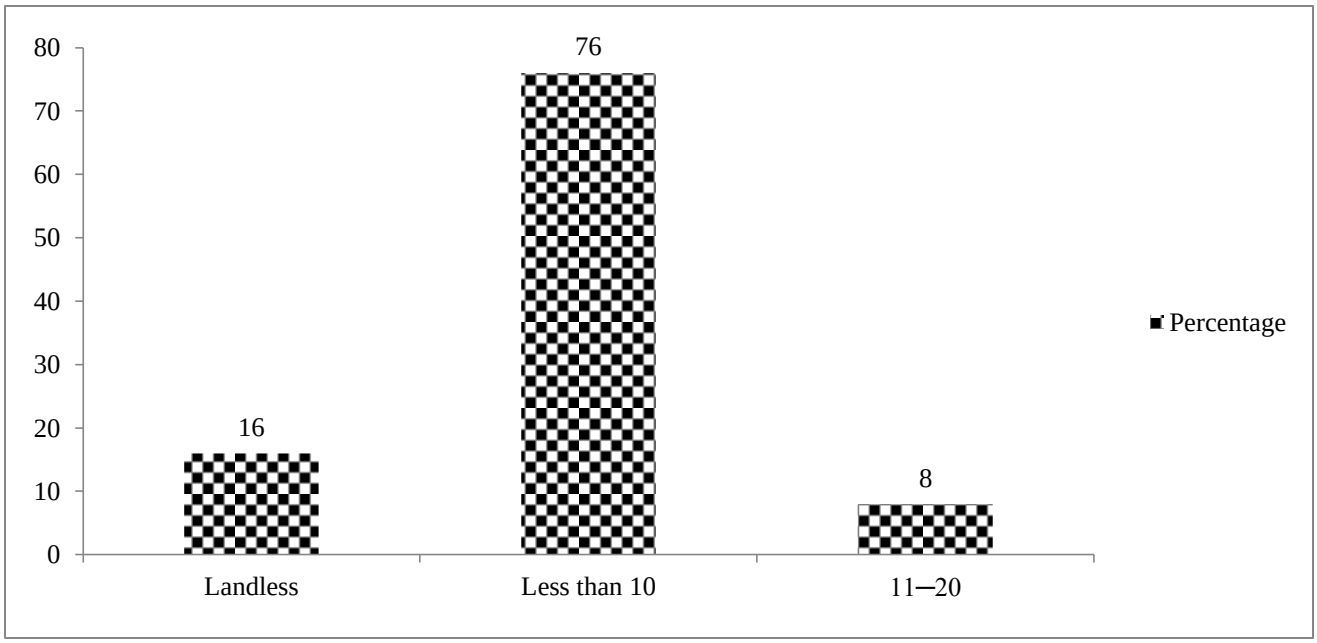
In Nepalese society, more land holding belongs to richness. Land is the means of production. By the proper utilization of the land, people can improve their living standard and quality life.

Table 4.5 Own Land holding pattern of the respondents

S.N.	Land area (*kattha*)	No. of HHs	Percentage
1	Landless	8	16
2	Less than 10	38	76
3	11-20	4	8
Total		50	100

Source: Field Survey, 2019

The graphs as presented show the land distribution of 50 HHs sampled randomly. Among them, 76% HHs hold less than 10 kattha of the lands only whereas major lands 11-20 are holding by 8% HHs. HHs who does not have their own lands was found to be 16%.



4.2.6 Structure of the House

House protects us from natural disasters and seasonal happenings like wind, heat, rain and provides the sense of security. Structure of the house may be different types like cemented, mud and stone, hay/straw roof type, metal sheet roof type and small hut and others. House is also an index of family financial status in Nepalese society.

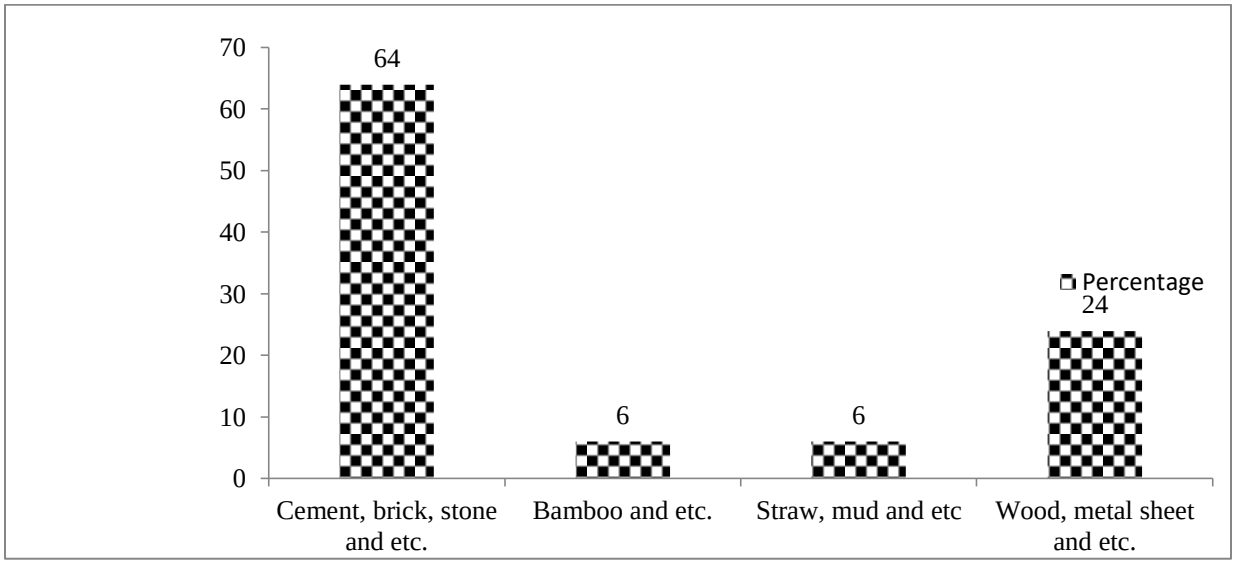
Table 4.6 Construction materials of the house of the respondents

S.N.	Construction materials	No. of HHs	Percentage
1	Cement, brick, stone and etc.	32	64
2	Bamboo and etc.	3	6
3	Straw, mud and etc.	3	6
4	Wood, metal sheet and etc.	12	24
Total		50	100

Source: Field Survey, 2019

Though Padampur is located in rural side of Kalika municipality, most of the houses are concrete made. As presented in the graphs calculated on the basis of 50 sampled HHs, 64% of the houses

were cement, brick and stone made. Similarly, 24% houses were made of wood and metal sheet. Rest houses were made of bamboo, straw and mud having the weightage 6% each.



4.2.7 Educational Status of the Respondent's Children

In the present world, education is considered as the first basic right for the children. Education helps for the overall development of the children. They must be provided by the educational facilities for their future development. Overall education status of the children of the country indicates the overall development status of the country.

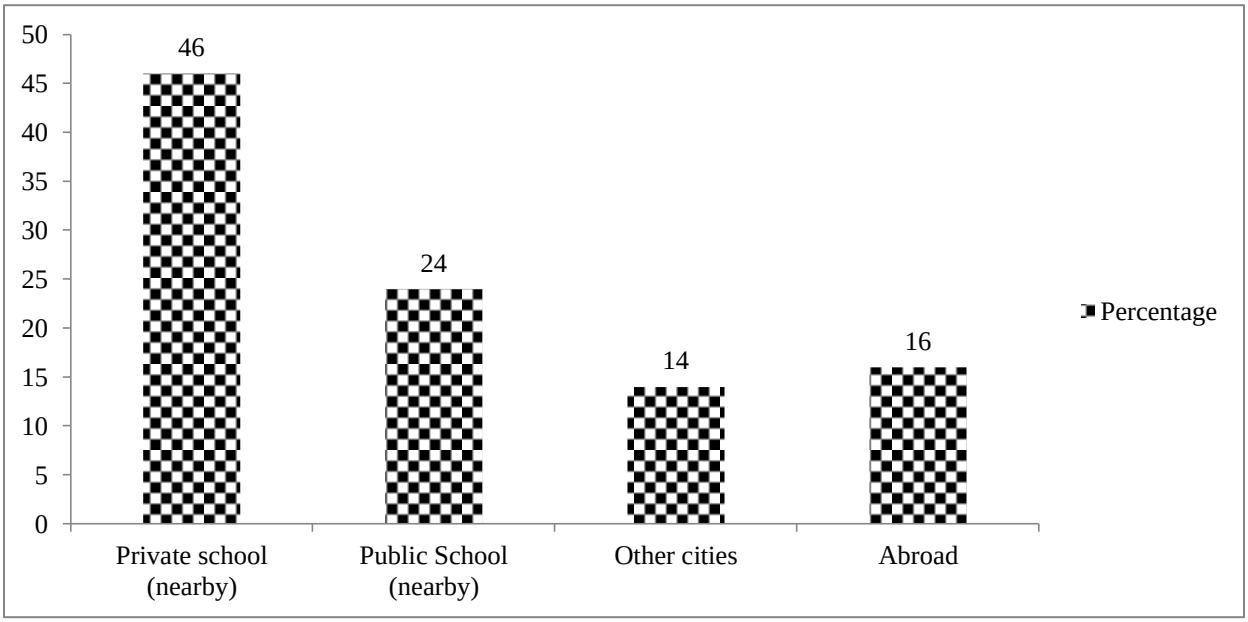
Table 4.7 School education of children of the respondents

S.N.	School education	No. of HHs	Percentage
1	Private school (nearby)	23	46
2	Public School (nearby)	12	24
3	Other cities	7	14
4	Abroad	8	16
Total		50	100

Source: Field Survey, 2019

During field survey through it was observed that most of the HHs sends their children to private school rather than government/public school. 46% of the HHs respondents send their children to private school whereas only 24% HHs respondents send their children to public school. Similarly,

16% and 14% HHs respondents send their children abroad and other cities for school education respectively.



4.2.8 Livestock Number in HHs

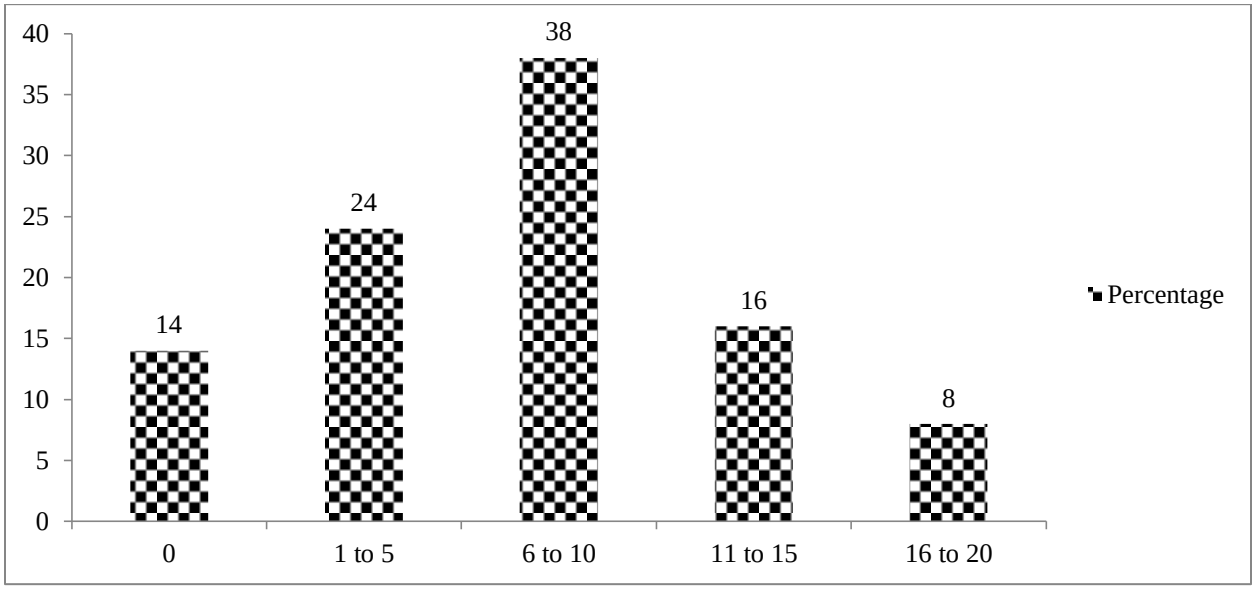
Livestock is also a good source of income generation mostly in rural areas of Nepal. Nowadays farmers are being more commercial and doing livestock farming commercially in large scale.

Table 4.8 Livestock numbers owned by respondents

S.N.	No of livestock	No. of HHs	Percentage
1	0	7	14
2	1-5	10	20
3	6-10	18	36
4	11-15	8	16
5	16-20	4	8
6	More than 20	3	6
Total		50	100

Source: Field Survey, 2019

The graphs shows the percentage of HHs holding most and least of livestock in Padampur as in sampled 50 HHs. 24% of the HHs have 1-5 numbers of livestock same as of 38% HHs hold 6-10 numbers of livestock in their house. Remaining 14% HHs did not have any livestock in their house. On discussion they said, due to low family members they can't afford time separately for livestock. Similarly, 16% of HHs has 11-15 livestock and 16-20 livestock are owned by next remaining 8% HHs.



4.2.9 Responded by Caste

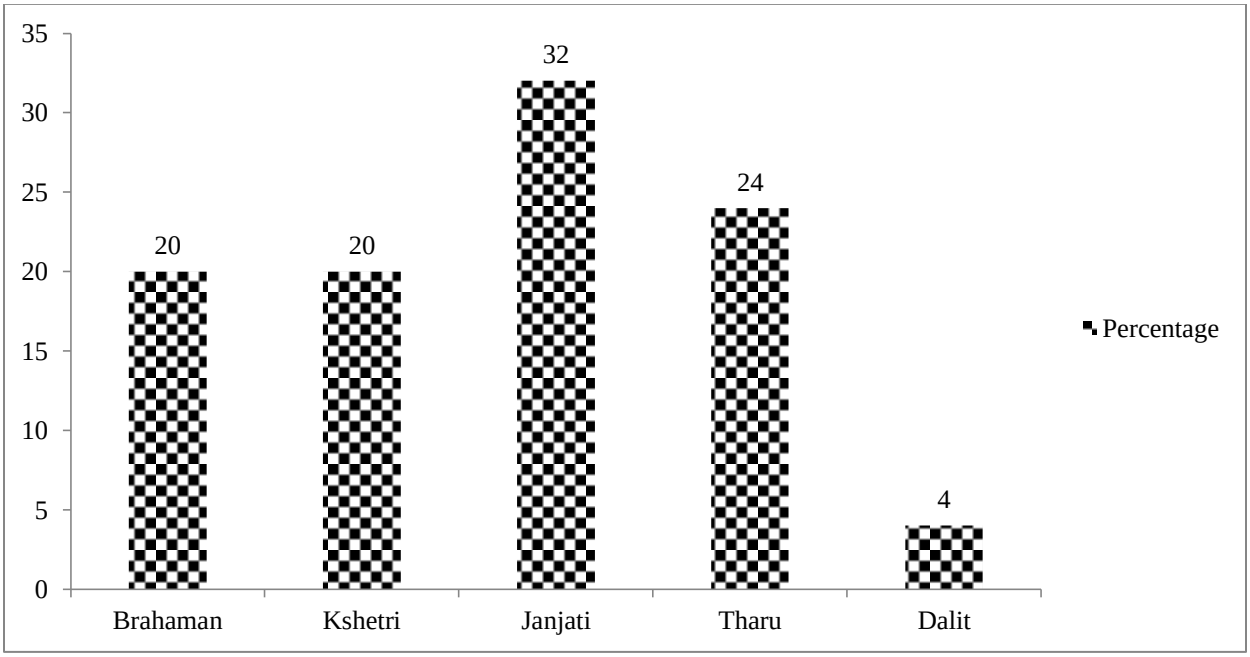
Caste is a social phenomenon which distinguishes one person from another on the basis of ethic based variables. Different castes are residing in the study area. The caste structure of the respondents on mushroom farming is given the table below.

Table 4.9 Responded by caste

S.N.	Caste	No. of HHs	Percentage
1	Brahaman	10	20
2	Kshetri	10	20
3	Janjati	16	32
4	Tharu	12	24
5	Dalit	2	4
Total		50	100

Source: Field Survey, 2019

During field observation it was found that most the farmers farming mushroom belong to janjati caste 32% followed by tharu which is 24%. Mushroom farmers belong to brahaman and kshetri were 20% each and while that of dalit were 4%.



4.2.10 Type of Mushroom Production

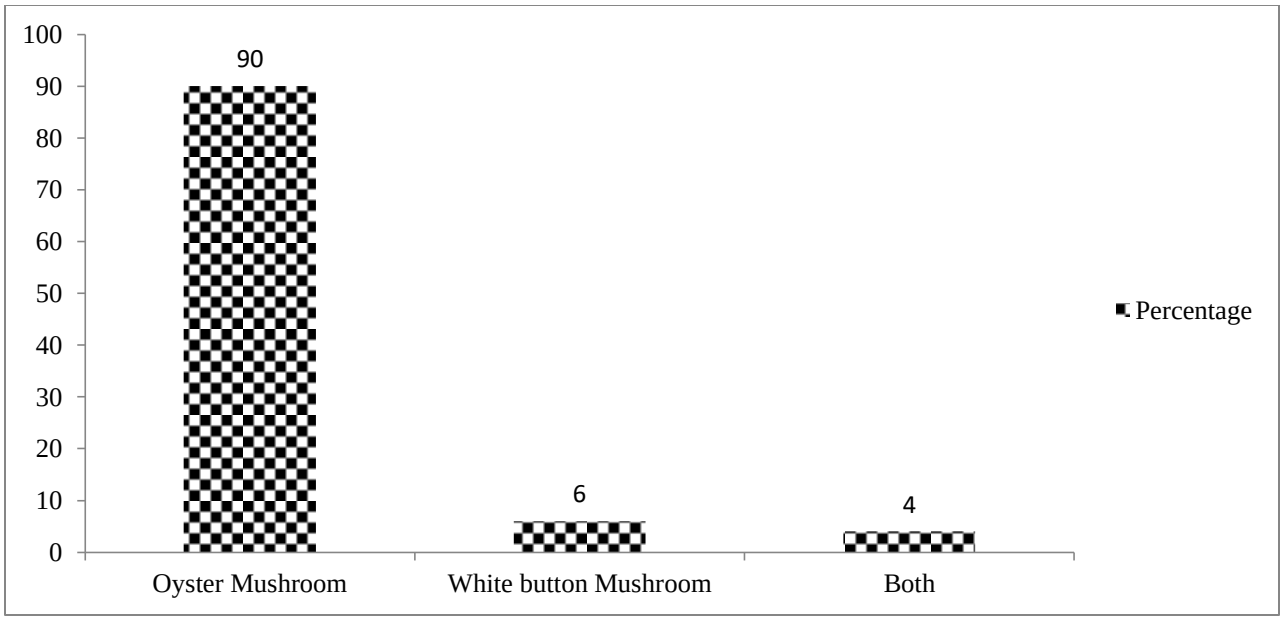
During the field survey it was found that only two types of mushroom are being produced namely oyster and white button mushroom.

Table 4.10 Responded by types of mushroom farming

S.N.	Types of mushroom	No. of HHs	Percentage
1	Oyster mushroom	45	90
2	White button mushroom	3	6
3	Both	2	4
Total		50	100

Source: Field survey, 2019

From the field survey 90% farmer were produce oyster mushroom and 6% produce white button mushroom and next 4% produce both.



4.2.11 Sources of Labor Supply

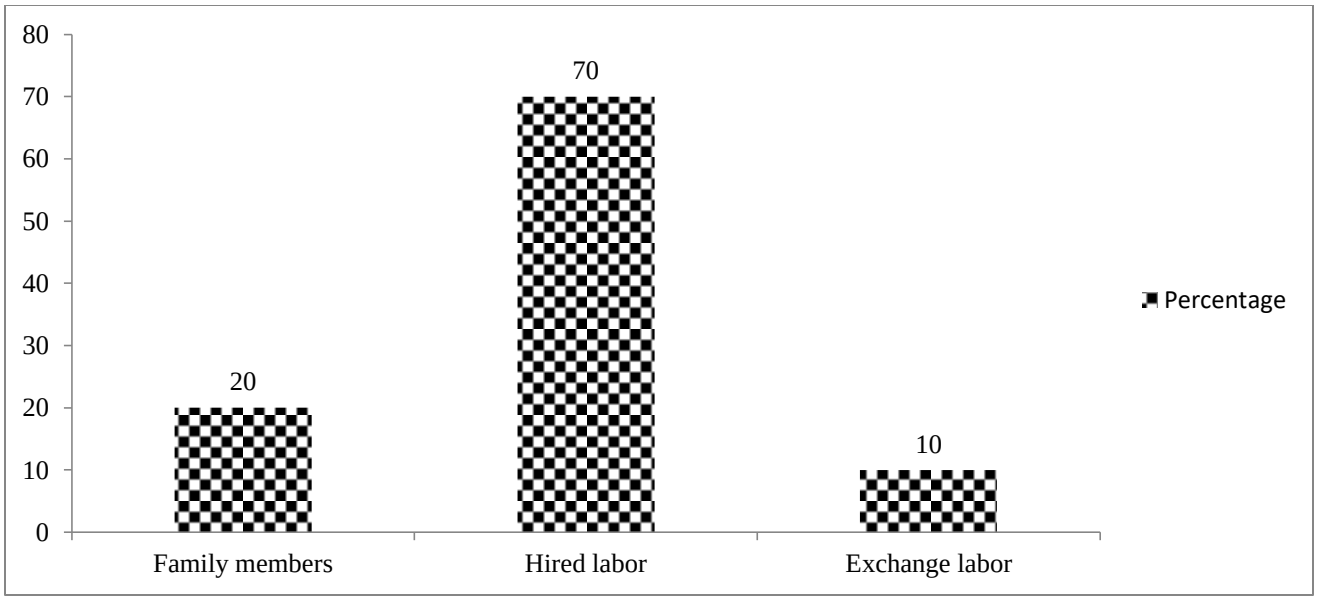
No agricultural activities can be done without the proper supply of man power, so in mushroom cultivation too enough supply of man power is required. The sources may be family member, hired labour and exchange labour as shown in table.

Table 4.11 Responded by sources of labor supply

S.N.	Sources of labor supply	No. of HHs	Percentage
1	Family members	10	20
2	Hired labor	35	70
3	Exchange labor	5	10
Total		50	100

Source: Field survey, 2019

The graph shows 70% of mushroom farmer complete their task by hiring labor for certain period while 20% completes their work by family members and next 10% by exchange pattern.



4.2.12 Saving Patterns of Respondents

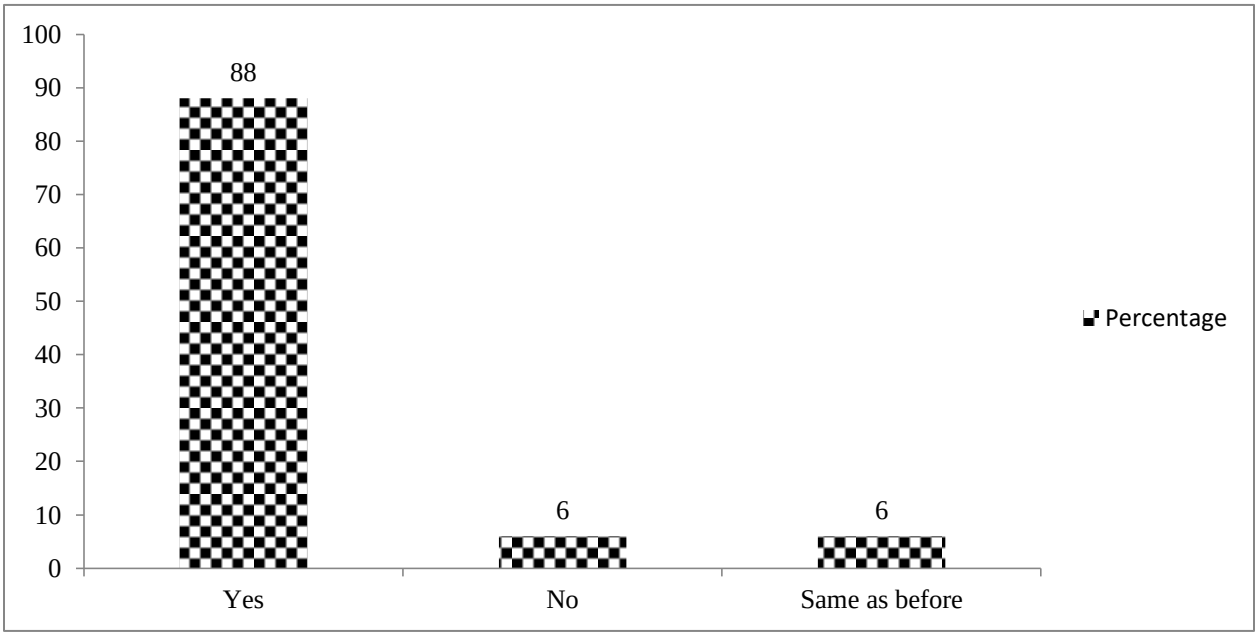
Mushroom farming is directly playing major role in saving increments. It has been observed that farmers involved in mushroom farming since long are still have been doing same due to financial attraction on it.

Table 4.12 Saving pattern of respondents

S.N.	Increasing in bank balance	No. of HHs	Percentage
1	Yes	44	88
2	No	3	6
3	Same as before	3	6
Total		50	100

Source: Field Survey, 2019

Face to face interaction with respondents during field survey, most of the respondents admitted that their saving has been increased after mushroom farming as compared to before. They also agreed on increased incomes from the same. As shown in the graphs and table 88% HHs admitted increased saving in banks and co-operatives as compared to before mushroom farming. But, still 6% HHs respondents were not agreed on increased saving similarly, rest 6% HHs have the saving same saving as before. At the end respondents also agreed that no increased saving or saving still as before is due to family expenses has been increased.



4.2.13 Access to better Medical Treatment

As the income sources are increased there is increase in saving resulting access to better medical treatment and better education. Since only healthy body and mind can contribute to the overall development of the country.

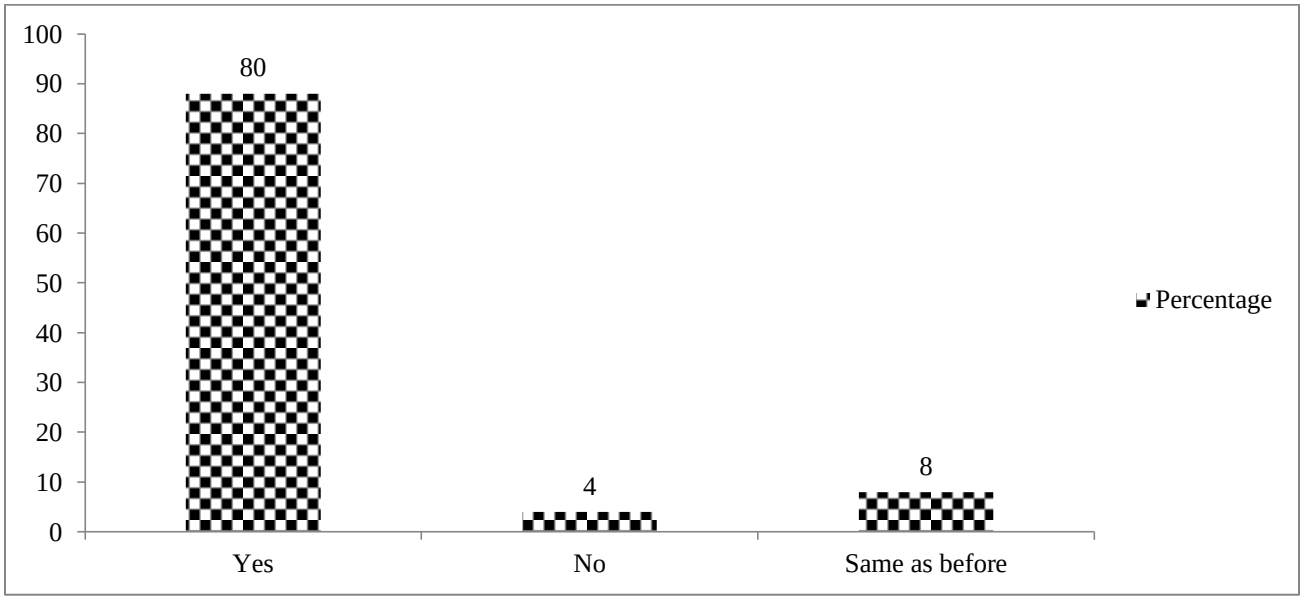
Table 4.13 Access to medical treatment of respondents

S.N.	Getting better medical treatment	No. of HHs	Percentage
1	Yes	40	80
2	No	8	16
3	Same as before	2	4
Total		50	100

Source: Field Survey, 2019

80% respondents in 50 HHs admitted that they have access to better medical treatment as compared to before. Previously they used to go to government hospitals or local medical store, now they are health conscious enough and go for immediate medical treatment in sophisticated hospitals or sometimes other cities if needed. Though majority of the HHs agreed on access to

better medical treatment, there was 4% HHs who did not agree that they have better medical access as compared to before and 8% HHs stuck on same medical treatment as before.



4.2.14 Access to better Social Life

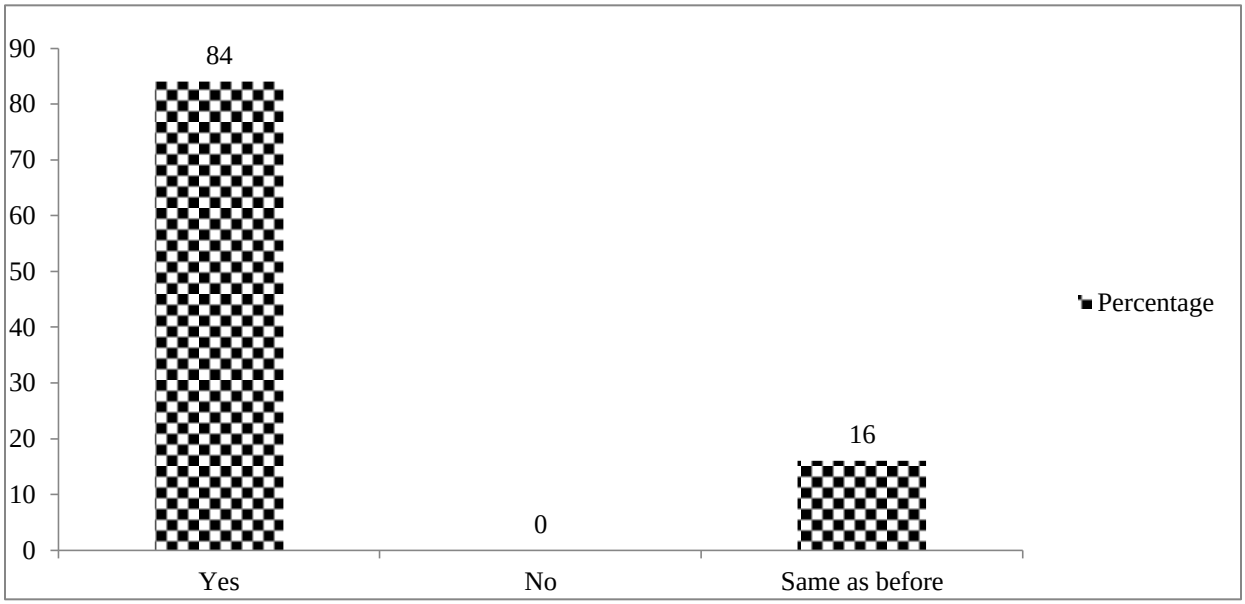
As the income sources are increased there is increase in saving resulting access to better social life as fulfillment of wishes.

Table 4.14 Feeling of better social respect

S.N.	Feeling of better social respect	No. of HHs	Percentage
1	Yes	42	84
2	No	0	0
3	Same as before	8	16
Total		50	100

Source: Field Survey, 2019

From the graph 84% HHs responded better social life after mushroom farming where as 16% responded same as before.



4.2.15 Recreation in Life

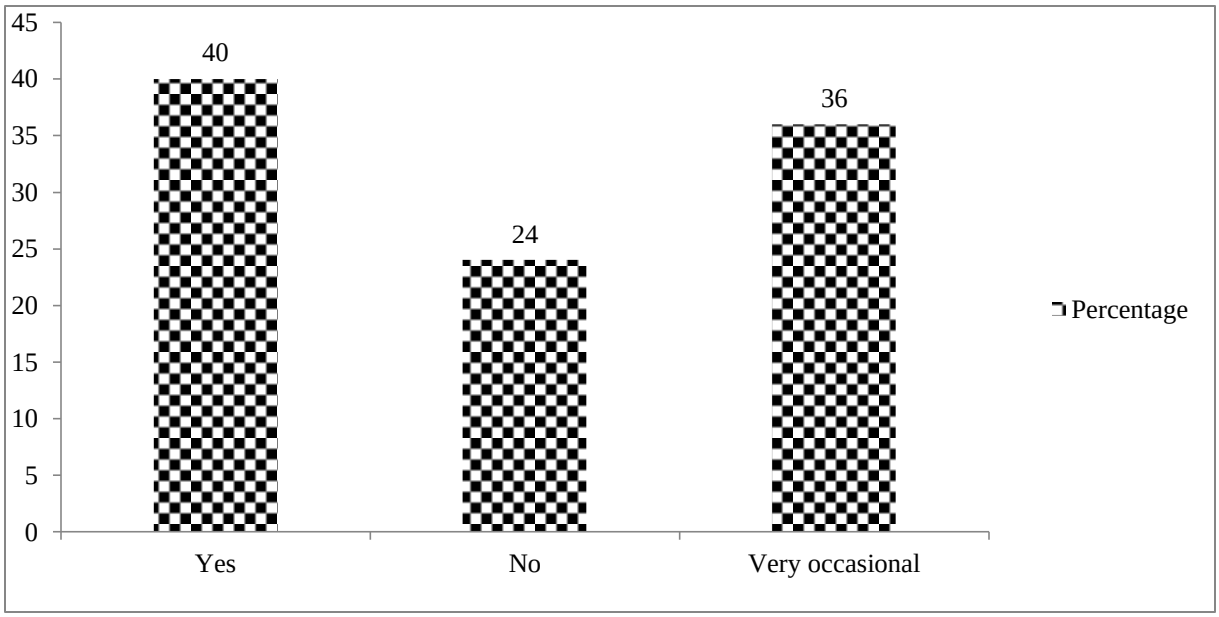
Participating in leisure and recreation activities can help you better manage stress and reduce depression. Leisure provides you the chance to find balance in your life; it also puts you in control of how you're spending your time, which is an important consideration because you may feel overwhelmed by obligations.

Table 4.15 Recreational activities of respondents

S.N.	Recreational visit/tour	No. of HHS	Percentage
1	Yes	20	40
2	No	12	24
3	Very occasional	18	36
Total		50	100

Source: Field Survey, 2019

From the graph 40% HHs responded having recreation activities after mushroom farming by earned money to reduce stress whereas 36% HHs very occasionally and 24% HHs are not involved due to busy working schedule.



4.2.16 Passive Income Generation

Earnings an individual derives from a rental property, limited partnership or other enterprise in which he or she is not materially involved. As with non-passive income, passive income is usually taxable; however it is often treated differently by the Internal Revenue Service (IRS).

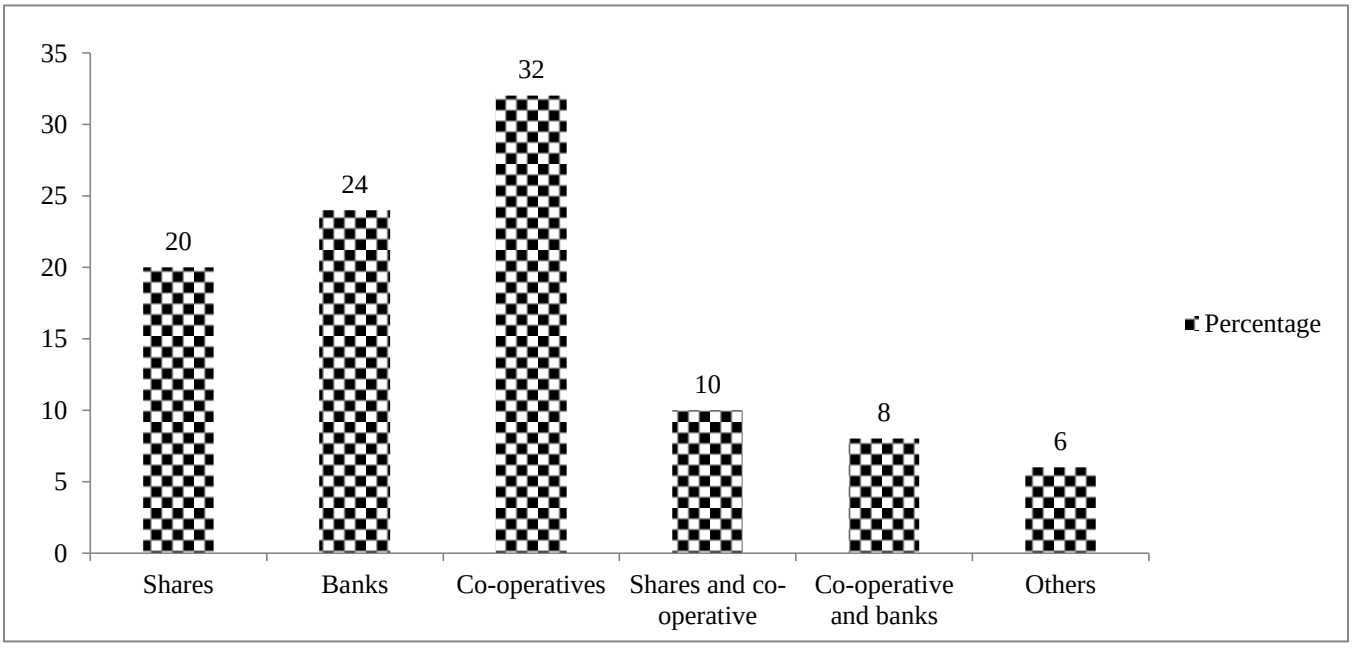
Table 4.16 Passive income generation source of respondents

S.N.	Investment on	No. of HHs	Percentage
1	Shares	10	20
2	Banks	12	24
3	Co-operatives	16	32
4	Shares and co-operative	5	10
5	Co-operative and banks	4	8
6	Others	3	6
Total		50	100

Source: Field Survey, 2019

After starting mushroom farming, the farmers started investing on different shares, banks, co-operatives and others as well. They admitted it was all because of income generated from mushroom cultivation and they became conscious on passive income generation. Most of the HHs have invested their fund on co-operatives and banks viz; 32% and 24% respectively. Similarly,

20%, 10% and 8% HHs have invested fund on shares, shares & co-operatives and Co-operatives & banks respectively. Whereas only 6% HHs invested on other passive income generation sources like lending money on interest at local level.



4.2.17 Improvements in Living Standard

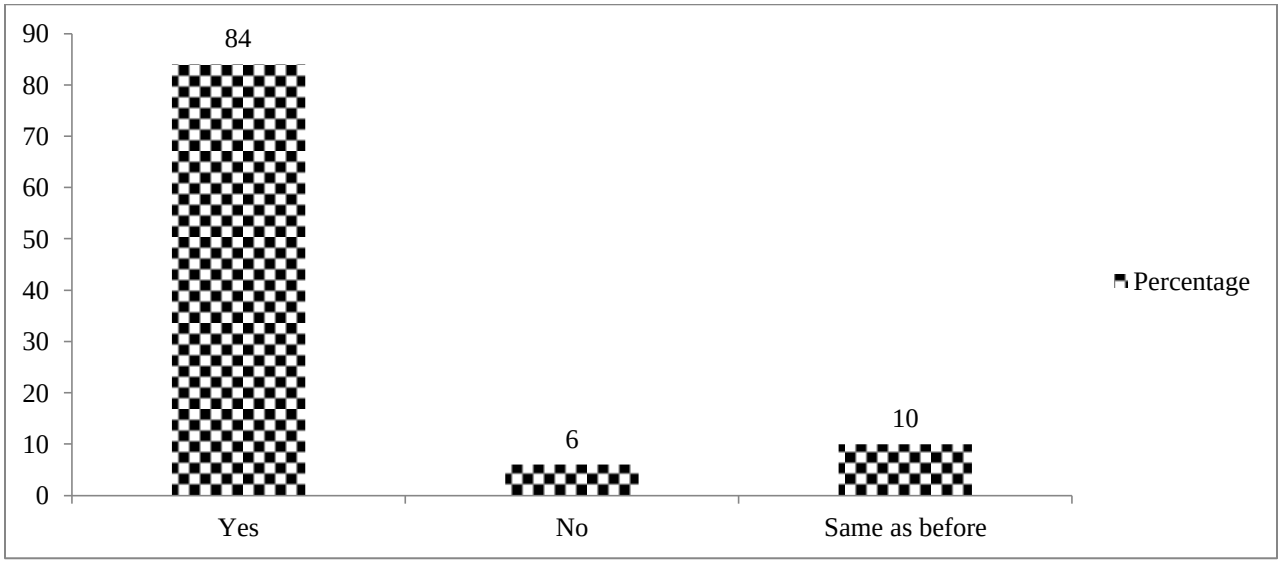
Standard of living refers to the level of wealth, comfort, material goods, and necessities available to a certain socioeconomic class in a certain geographic area, usually a country. The standard of living includes factors such as income, quality and availability of employment, class disparity, poverty rate, quality and affordability of housing, hours of work required to purchase necessities, gross domestic product, inflation rate, amount of leisure time every year, affordable (or free) access to quality healthcare, quality and availability of education, life expectancy, incidence of disease, cost of goods and services, infrastructure, national economic growth, economic and political stability, political and religious freedom, environmental quality, climate and safety. The standard of living is closely related to quality of life.

Table 4.17 Improvement in lifestyle of the respondents

S.N.	Improved lifestyle	No. of HHs	Percentage
1	Yes	42	84
2	No	3	6
3	Same as before	5	10
Total		50	100

Source: Field Survey, 2019

At the end of the field survey it was observed that most of the HHs respondents admitted that they have improved living standard. 84% of the HHs agreed to improved living standard with better health status and quality life. Similarly, 6% HHs respondents were not agreed on change in living standard even after mushroom farming and 10% HHs respondents said same living standard as before.



4.3 Cost of Cultivation of Mushroom

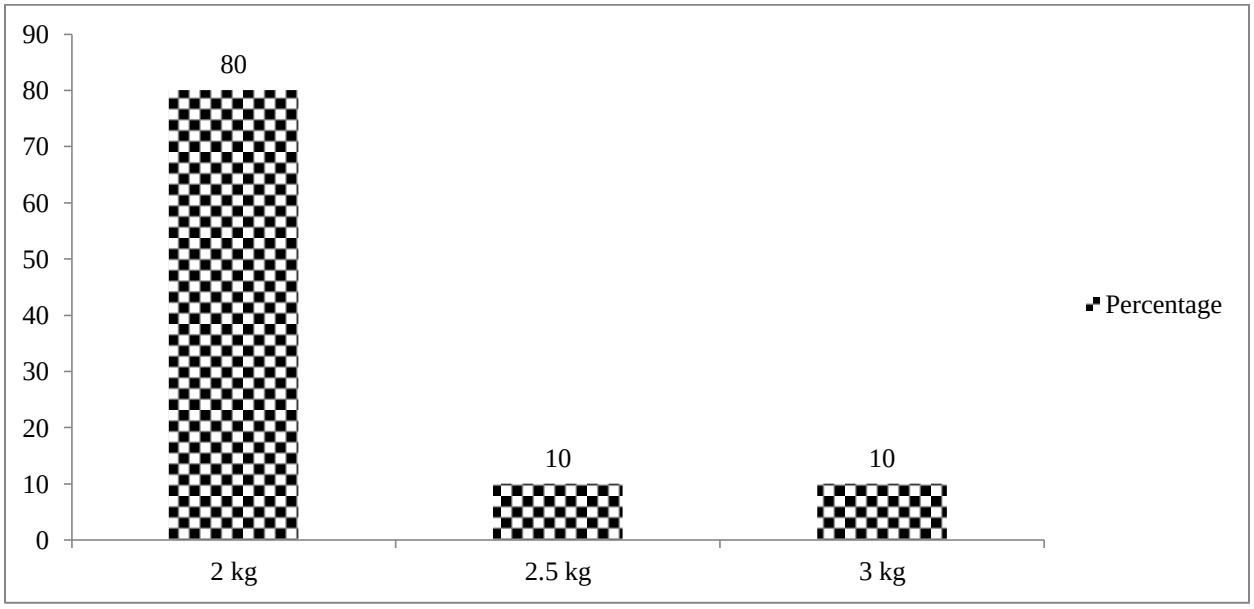
After the completion of the study by researcher it was found that minimum time duration for the production of mushroom is 20-25 days. Mushroom production in the study area is done in plastic bag, mushroom production can be vary on the basis of quality of hay, environment of shed, amount of water supply though after the research it was found out that average per bag production is about 2-3 kg.

Table 4.18 Average production per bag

S.N.	Production per bag (kg)	No. of HHs	Percentage
1	2	40	80
2	2.5	5	10
3	3	5	10
Total		50	100

Source: Field Survey, 2019

From the graph 80% HHs produces 2 kg mushroom per bag while 10% each produces 2.5 kg and 3 kg respectively.



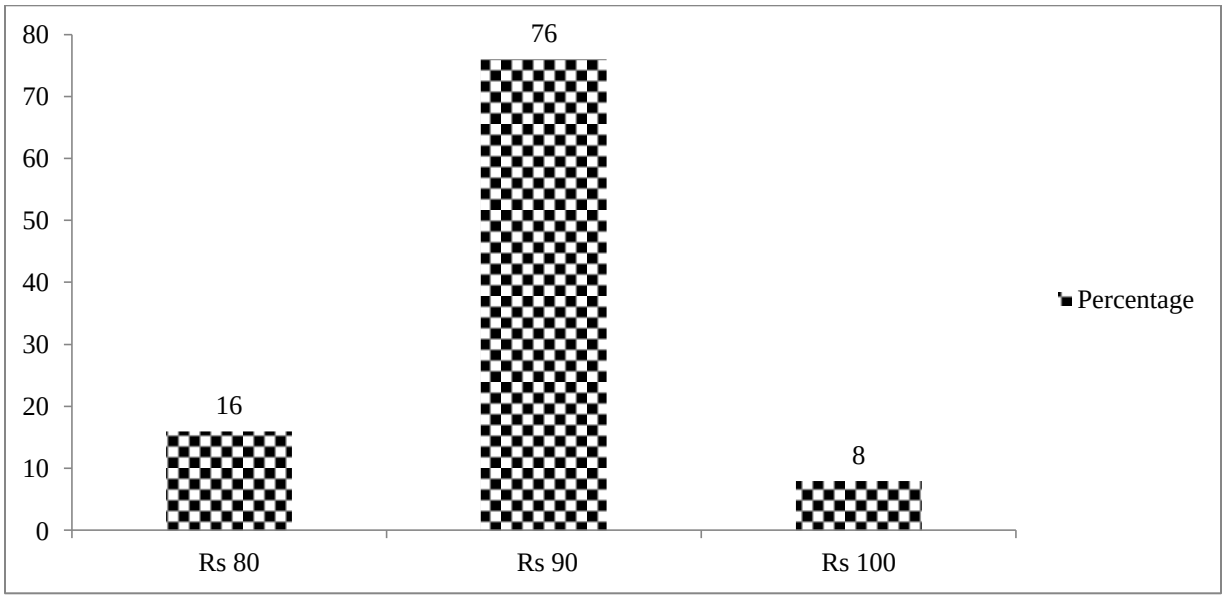
The production cost includes cost of paddy straw, spawn, polythene bags, labour cost, transportation cost. According to the respondents it was found out that average cost of mushroom production per kg is Rs. 80 to 100 without taking depreciation.

Table 4.19 Cost of production per kg

S.N.	Production cost per kg (Rs)	No. of HHs	Percentage
1	80	8	16
2	90	38	76
3	100	4	8
Total		50	100

Source: Field Survey, 2019

From the graph 76% mushroom growers responding production cost Rs 90 per kg while 16% & 8% growers produces with cost Rs 80/kg and Rs 100/kg respectively. Most of farmers sells mushroom with Rs 120 per kg to retailer.



4.4 Constraints faced by Mushroom Growers

The mushroom industry is gradually increasing but the pace is rather slow because of insufficient scientific support and inadequate training program. Following problems are noticed during field survey of 50 HHs.

Table 4.20 Constraints faced by mushroom growers

S.N.	Constraints	No. of HHs	Percentage
1	Lack of straw	5	10
2	Lack of finance	28	56
3	Lack of information about marketing	35	70
4	Inadequate knowledge about mushroom production technology	40	80
5	Availability of spawn	25	50
6	Problems of grading and packing	12	24
7	Problems of payment	12	24
8	Problems of storing	21	42
9	Lack of technically sound labour	44	88
10	Lack of good quality of spawn	38	76
11	High price of spawn	41	82
12	Lack of own funds	12	24
13	Lack of transport	17	34

Source: Field Survey, 2019

It was observed from the table that only small growers 10% realized shortage of straw. Although, straw and plant residues are abundantly available with the growers and the environment is conducive for growing of mushroom. Spawn of desired quality and quantity was a big problem in mushroom cultivation. 76% mushroom growers are facing lack of good quality spawn at time of cultivation while 50% responded facing problem of availability of spawn at time of cultivation. 82% mushroom farmers reporting high price of spawn. Spawn are prepared by employing proper scientific techniques but it is not easily available in the study area.

Overall 70 per cent growers reported the marketing problem. Majority of the mushroom growers were small as a result they had low volume of production. The marketing of produce in small quantity increase the per unit cost of marketing, resulting in low profits. The other problems of marketing were observed as low demand in the locality, perishability of mushroom, low price, high marketing cost and lack of marketing information etc.

About 80 per cent growers are facing problem of lack of knowledge. Farmers are not yet educationally competent as the profitability and prosperity of cultivators through mushroom farming has not yet reached at the desired level. There is lack of motivation and advisory on the part of growers. Serious extension efforts are required to motivate them, train them and convince them about profitability from mushroom cultivation.

Mushroom is a perishable commodity, therefore its storage is a great problem. About 42% growers reported the storing problem. Both public and private sectors must come forward and contribute in developing storage and canning facilities growers so that the produce is rightly handled and sold with sizeable profit in the study area. Postharvest training for drying, pickle making and mushroom soup making should be lunched so that both preservation and increase in profit for farmers.

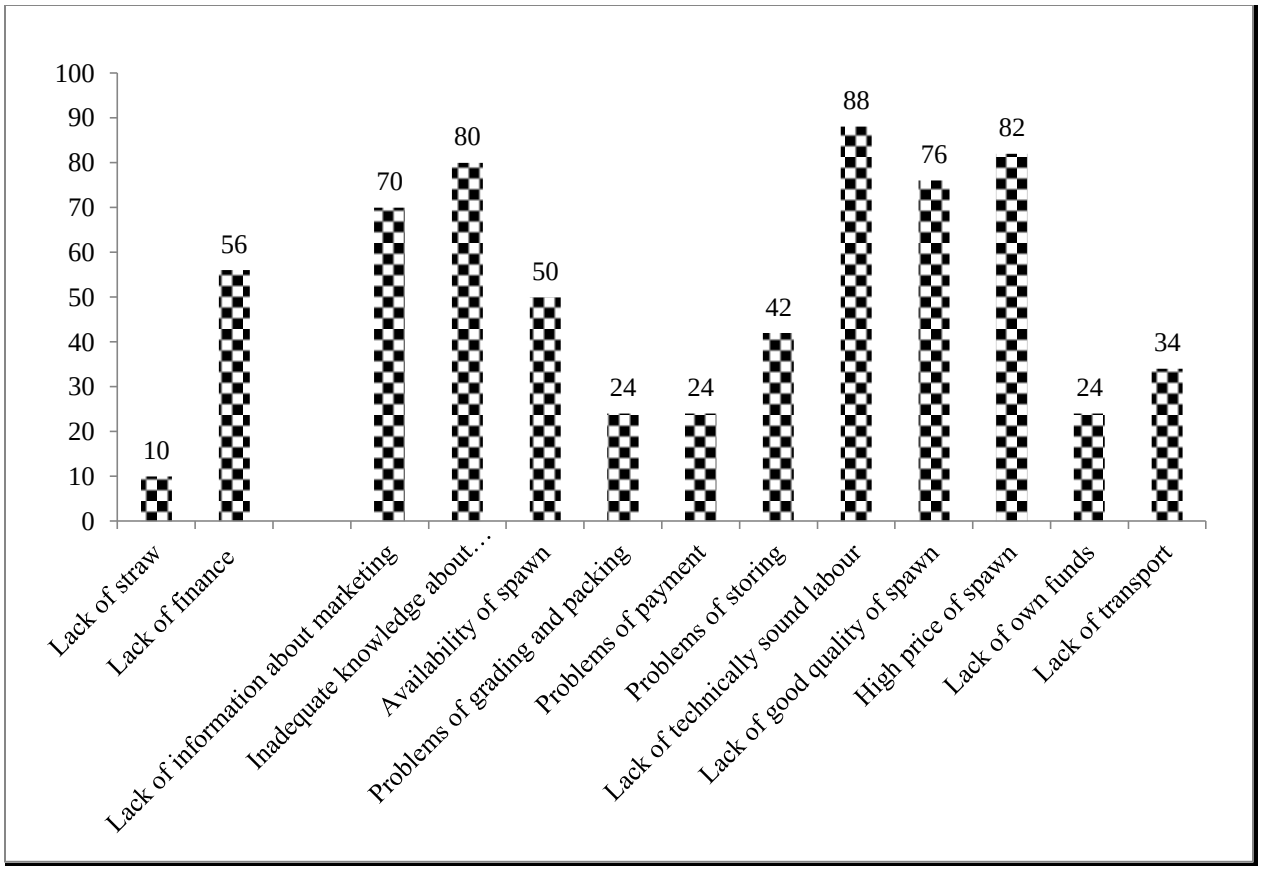
As much as 24 % of mushroom growers faced the problem of grading and packing. 24% growers reported the problem of payment after sale of produce. The problem of payment occurs due to uncertain demand of mushroom in the market.

The cultivation of mushroom being highly scientific endeavor requires specialized labour for the purpose. About 88 per cent growers reported the non-availability of technically sound labour.

The lack of own fund with the growers is a big hurdle in undertaking the activity and further increasing the scale of operation. About 24% cultivators are facing fund problems.

The growers usually faced many difficulties in obtaining finance. Long procedures and a lot of formalities, the files moving from table to table are reported to be the main cause. About 56 per cent growers at overall level faced the problem in obtaining finance for mushroom production.

Lack of transportation of mushroom was reported by 34% mushroom farmers. Due to perishability of mushroom, its supply line needs to be strengthened.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34
Lack of straw
Lack of finance
Lack of information about marketing
Inadequate knowledge about…
Availability of spawn
Problems of grading and packing
Problems of payment
Problems of storing
Lack of technically sound labour
Lack of good quality of spawn
High price of spawn
Lack of own funds
Lack of transport

CHAPTER –V: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The research study was conducted on socio-economic impacts of the mushroom farming to the local community of Padampur, Kalika, Chitwan who were directly involved in the same. It was a descriptive as well as analytical study of about the socio-economic impacts of the mushroom farming. For the completion of the research mostly primary data was used which was directly collected from field survey. Total 50 HHs were randomly selected to fulfill the objectives of the research. The pre-structured questionnaire was designed to meet the objective of the study and was filled by the key person as a respondent.

Regarding the age group of respondents, 38% of the 50 HHs belong to age group 40-50 while only 6% belonging to age above 60.

Regarding the no. of people in the family of the respondents, 44% of the 50 HHs have family members 5-6 whereas, the least i.e. only 6% HHs have 1-2 family members they were mostly father and mother, since their children had gone abroad or other cities for education or employment.

Based on the field survey it was concluded that most the respondents 46% were appeared school level education and that was grade 8 to grade 12 whereas, 10% of the respondents had taken other special type of education like education for aged people conducted by community and/or government.

Regarding on the income sources of the HHs, most of the HHs i.e. 36% of the total sampled were having remittance and agriculture, whereas, only 8% of the HHs have service, business and agriculture as the sources of income.

There were 76% of the HHs which were having less than 10 *kattha* of own lands, where as 16% of the HHs were landless though they were involved in mushroom farming.

During field survey it was observed that most the houses of the respondents were made of concrete, brick & stone and on data analysis and interpretation it was found that 64% of the HHs were having the same, whereas only 6% HHs were having house made of bamboo and etc. and Straw, mud and etc.

During face to face conversation, it was concluded that the percentage of the children going to private school has been increased as compared to before and also a trend of going abroad for

further education is in practice in Padampur now. The respondents themselves admitted that, their children better education nowadays. On survey it was found that all the respondents send their children school. Similarly, data interpretation shows that 46% of the HHs sends children to private school for good education and 14% of the HHs sends their children other cities for education.

Regarding on no. of livestock in house, there were 6% HHs who were having livestock more than 20, similarly, there were 36% of HHs with 6-10 livestock in house.

It was found that 70% of mushroom farmer complete their task by hiring labor for certain period and 10% by exchange pattern.

Talking about the saving pattern of respondents, 88% of them admitted that t Regarding social structure 32% HHs mushroom growers belong to janjati and only 4% belong to dalit sector while brahaman and kshetri are 20% each.

According to study 90% HHs growing oyster mushroom due to ease of production and profit within short time while 4% of HHs growing both oyster and white button mushroom.

They were increased saving in banks and also agreed on overall financial improvements after starting mushroom farming.

Based upon the primary data collected via questionnaire method, 80 % in the HHs out of 50 HHs agreed for getting better medical treatment as compared to before, though 16% of the HHs denied it. Alike with better medical treatment and increased saving in bank accounts, they were also agreed on better social respect and regards by neighbors. Overall, it was concluded that people involved in mushroom farming were having better social and financial status as compared to before which was based upon the data provided by the 84% of the HHs in 50 HHs.

After the completion of the study by researcher it was found that minimum time duration for the production of mushroom is 20-25 days and 80% growers produce 2 kg mushroom per bag.

According to the respondents it was found out that average cost of mushroom per kg is Rs. 90 without taking depreciation of fixed assets. Most of farmers sells mushroom with Rs 120 per kg to retailer.

The mushroom farming is gradually increased with facing different constraints found during survey. The major problem facing are lack of information about marketing, availability of good quality spawn, high price of spawn, lack of technical knowledge to increase productivity,

marketing, product storage, preservation and product development and non-availability of technically sound labour.

On study it was found 76% mushroom growers are facing lack of good quality spawn at time of cultivation while 50% responded facing problem of availability of spawn at time of cultivation. 82% mushroom farmers reporting high price of spawn. Overall 70 per cent growers reported the marketing problem. About 80 per cent growers are facing problem of lack of knowledge . About 88 per cent growers reported the non-availability of technically sound labour.

5.2 Conclusion

Analyzing the various findings of this research it can be concluded that mushroom farming has positive impacts on the farmers and seen socio-economic life improved with the acceptance of this profession professionally. With having the different problem in this profession, farmers are ready to take the advantages of this field.

Different varieties of mushroom farming techniques can be introduced in the study area so that farmers can choose the best one for themselves. Trainings and ideas should be share to the farmers so that they can produce mushrooms in equal quantity in all seasons.

In this research, socio-economic impact of mushroom farming on farmers was analyzed thoroughly. Farmer's education and occupational background, land holding size, structure of the house, no. of livestock in house, social respect and medical treatment by their family members have been found continuously improved.

5.3 Recommendations

Regarding on the recommendation here, it should be focused on which direction the problem exists. The modern machines should be distributed in low price to the farmers so that production cost can be minimized resulting decent production. Modern techniques of mushroom production should be encouraged among farmers for better production as most of the farmers are still following the traditional method. The district level and village level mushroom cultivation group should be supported by giving them technical, economic, physical and other helps. They are the real organization of field workers.

Based upon the thesis conducted, recommendations can be listed as follows:

i. Socio-economic impacts can be studied for all the indirect stock holders as well.
ii. National and international policies, technologies and subsidies regarding mushroom farming can be studied further.

iii. Role of women and women empowerment through mushroom farming can be studied.

iv. The impact of food crop commercialization on gender roles can be studied.

v. Factors influencing the adoption of new farming technologies can be studied.

vi. The role of producer organization ns in linking small-scale farmers to high-value markets can be studied.

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APPENDIX

1. Questionnaire Survey

Socio-Economic Status of households, Padampur, Kalika Municipality, Chitwan.

1. Identification

Name		Sex	
Age		Religion	
Size of family		Male	
Ward no.		Female	
Caste		Marital Status	

2. What is your highest level of education?

a. grade 1 to grade 7 b. grade 8 to grade 12
c. tertiary school d. none of the above

3. What are the sources of income? (note: can be marked in more than one source here)

a. Service b. Business

c. Agriculture d. Remittance

4. How many people are working in in family for income generation…….

5. Do you have your own land?

a. Yes b. No

Note: If yes mention how much…….

6. Types of materials used to make house.

a. Cement, brick, stone etc. b. Bamboo and etc.

c. Straw, mud and etc. d. Wood, metal sheet and etc.

7. Where do children go for study?

a. Private school b. Public school

c. Other cities d. Abroad

8. How many livestock do you have?

S.N.	Livestock	Total Number
I	Cow	
Ii	Goat	
Iii	Buffalo	
V	Pig	
V	Others	

9. How much land you are cultivating now?

Please mention……..…….

10. What type of mushroom are you farming?

a. Oyster Mushroom b. White button Mushroom c. Shiitake Mushroom d. Red Mushroom

11. How long it takes time for one product?

a. 3 weeks b. 5 weeks c. 7 weeks

12. How much produced in kg per bag?

Please mention……

13. How much cost for per kg production?

Please mention……

14. How much selling price per kg in market?

Please mention…….

15. Have you got any training opportunity for mushroom farming/cultivation?

a) Yes b). No

If yes, please specify.

i. Who gave the training?

a. Government b. Cooperatives c. NGOs/INGOs d. Private sectors

16. What are the sources of labor supply for mushroom cultivation?

a. Family members b. Hired labor c. Exchange labor d. If others specify

17. What type of agriculture activity are you performing now?

Please mention…….

18. What was the agricultural cultivation you were doing before mushroom farming?

Please mention……..

19. Is there any increment on saving in bank?

a. Yes b. No c. Same as before

20. Are you getting better medical treatment as compared to before?

a. Yes b. No c. Same as before

21. Do you feel better social life after you started mushroom farming?

a. Yes b. No c. Same as before

22. Do you participate on social activities held in society?

a. Yes b. No. c. Occasional

23. Do you have any means of transportation, Please mention……

24. Do you go for recreational visits/tours?

a. Yes b. No c. Occasional

25. Do you go theaters?

a. Yes b. No c. Occasional

26. What are the physical assets you are having? Please mark the Tick (√)

Physical assets	Before	Now	Remarks
a. Agricultural tools			
b. Vehicles			
c. TV/Radio			
d. Telephone/Mobiles			
e. Refrigerator			
f. Computers/Laptops			
d. Landholdings			

27. Do you have investments on Banks, Co-operatives, Shares or others after starting mushroom cultivation?

a. Yes b. No. c. Same as before

28. Do you feel you have financially improved lifestyle as compared to before?

a. Yes b. No c. Same as before

29. Why did you start mushroom farming?

……..

…….

30. How much is your investment for existing farming throughout the year?

…….

31. How much profit are you taking from existing farming?

…….

32. Have you got an access of market in your locality to sell the products?

……

33. Will you go continue on this farming?

a. Yes b. No, I will change

c. Other, please mention.....……..

34. What type of raw materials, equipment and technology are you using for mushroom farming?

Raw Materials……

Equipment……..

Technology……..

35. Is the income from this occupation enough to meet of your families need?

a. Yes b. No

36. What are the changes you are going through after starting mushroom farming?

……..

37. Any comments or suggestions on people involving in mushroom farming, please write.

……..

……..

38. Constraints about mushroom production followed in study area

1	Is lack of straw?	Yes/No
2	Lack of information about marketing.	Yes/No
3	Lack of finance.	Yes/No
4	Inadequate knowledge about mushroom production technology	Yes/No
5	Availability of spawn	Yes/No
6	Problems of grading and packing	Yes/No
7	Problems of payment.	Yes/No
8	Problems of storing	Yes/No
9	Lack of technically sound labour	Yes/No
10	Lack of own funds	Yes/No
11	Lack of good quality of spawn	Yes/No
12	Lack of transport	Yes/No
13	High price of spawn	Yes/No

I appreciate your support, Thank you ☺

2. Photo gallery




Mushroom Farming

Mushroom Farming

Thresher

Straw Cooking

Trolley

Chopped straw