MICROECONOMIC ANALYSIS OF APPLE FARMING DURING COVID-19: THE CASE OF MUSTANG DISTRICT

A Thesis

Submitted to

Central Department of Rural Development, Tribhuvan University

In Partial Fulfilment of Requirement for the

Degree of Masters of Arts (MA)

In

Rural Development

By

CHANDRA PURJA

Exam Roll Number: 282491

TU Registration Number: 5-2-48-2481-2012

Central Department of Rural Development, Tribhuvan University

Kirtipur Kathmandu

March 2022

DECLARATION

I hereby declare that the thesis entitled **MICROECONOMIC ANALYSIS OF APPLE FARMING DURING COVID-19: THE CASE OF MUSTANG DISTRICT** submitted to the Central Department of Rural Development, Tribhuvan University, is entirely my original work prepared under the guidance and super vision of my supervisor. I have made due acknowledgements to all ideas and information borrowed from different sources in course of preparing this thesis. The results/findings of this thesis have not been submitted anywhere else for the 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.

_____

Chandra Purja
Degree Candidate

Date: 2078/11/13
25th February, 2022

LETTER OF RECOMMENDATION

The thesis entitled **MICROECONOMIC ANALYSIS OF APPLE FARMING DURING COVID-19: THE CASE OF MUSTANG DISTRICT** has been prepared by **Chandra Purja** under my guidance and super vision. I hereby forward this thesis to the evaluation committee for final evaluation and approval.

_____

Dr. Rajan Binayek Pasa

Thesis Supervisor

Central Department of Rural Development

Kirtipur, Kathmandu, Nepal

Date: 2078/11/15

27th February, 2022

APPROVAL LETTER

The thesis entitled **MICROECONOMIC ANALYSIS OF APPLE FARMING DURING COVID-19: THE CASE OF MUSTANG DISTRICT** submitted by Mr. Chandra Purja in partial fulfillment of the requirements for the Degree of Master in Arts (MA) in Rural Development has been approved by the evaluation committee.

Evaluation Committee

_____

Assoc. Prof. Bishnu Bahadur Khatri
Head of the Department

_____

Dr. Umesh Acharya
External Examiner

_____

Dr. Rajan Binayek Pasa
Thesis Supervisor

Date: 2078/11/20
04th March, 2022

ACKNOWLEDGEMENTS

ABSTRACT

Apple farming has been playing significant role in the micro economic development of Nepal. This study entitled Microeconomic Analysis of Apple Farming during COVID-19: The Case Study of Mustang District thus tried to analyze private and social returns of apple farming. Methodologically, this study applied quantitative approach and survey research strategy. Required data/information were collected by applying household survey and key informant interview techniques in which survey questionnaires and interview guidelines were used as tools of the study. More specifically, survey questionnaires were filled up by 156 apple farmers belonging to three villages: Marpha, Tukche and Syang selected purposively and randomly. More specifically, of the total 156 respondents, 60 respondents were selected from Maprha, 48 were selected from Tukche and Syang. The theoretical ideas such as economics of agriculture development, agriculture transformation and integrated farming system have been applied while interpreting the data.

The study found that 67.7 percent of the farmers belong from 41-60 years age group and 80.8 percent were male farmers. The education level among the farmers was 30.1 percent for both primary and lower secondary level. Below 90.0 percent of the farmers have food sufficiency less than 9 months from their own production. The mean average income of the family from agriculture, business, remittance are Rs. 678076.92, Rs. 457733.33, Rs. 722321.43, and average income of the family is Rs. 553014.6. The average expenses of the family in different purpose are Rs. 79746.19. The average expenses for Vitamin/Fertilizers/Pesticide and labour are Rs. 133807.7 and Rs. 90445.51 and the average expenses in the apple farming is Rs. 52163.23 and the average yearly income from the farming is Rs. 607371.8. The average farm gate price of the apple is Rs. 119.68, average retailer price is Rs.92.16 and average market price (paid by consumer) Rs. 162.72. Apple farming from the district are having different problems such as shortage of storage house, manpower, shortage of vitamins and fertilizers. During COVID-19, not a single farmer received financial compensation and aid from governing body. All in all, this study comes up with the conclusion that agriculture in particular help to improve living standard of the farmers and other stockholders like retailers, driver, labour, and the other entrepreneurs.

Finally, the empirical findings of the study can be applied in knowledge level, practice level and policy level by the readers, local development stakeholders as well as agriculture development planner and policy makers.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURE

ABBREVIATIONS AND ACRONYMS

AD	:	Antonio Domino
ADB	:	Agricultural Development Bank/ Nepal
APP	:	Agriculture Perspective Plan
ADS	:	Agriculture Development Strategy
CBS	:	Central Bureau of Statistics
DC	:	Development Cooperative
DCC	:	District Coordination Committee
EU	:	European Union
FAO	:	Food and Agriculture Organization
FY	:	Fiscal Year
GDP	:	Gross Domestic Product
HDI	:	Human Development Index
HE	:	Hector
ICS	:	International Cooperative Society
IFAD	:	International Fund for Agriculture Development
IRDP	:	Implemented Integrated Rural Development Program
JICA	:	Japan International Cooperation Agency
INGO	:	International Non-Governmental Organizations
LTR	:	Literate
MOF	:	Ministry of Finance
NDDP	:	National Dairy Development Board
NGO	:	Non-Government Organization
NPC	:	National Planning Commission
PC	:	Percent
PMAMP	:	Prime Minister Agriculture Modernisation Project
SQ	:	Square kilometer
TU	:	Tribhuvan University
UN	:	United Nations
US	:	United States
USDA	:	United States Development of Agriculture
VDC	:	Village Development Committee
WTO	;	World Trade Organization
WWW	:	World Wide We

CHAPTER I

INTRODUCTION

1.1 Background of the Study

The English word agriculture derives from the Latin *ager* (field) and *colo* (cultivate) signifying, when combined, the Latin *agricultura*: field or land tillage. In simple terms, agriculture is the science and art of cultivating plants and livestock. Agriculture can be defined as the science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the resulting products (Merriam-webster dictionary). Defined broadly, agriculture includes farming both animals (animal husbandry) and plants (agronomy, horticulture and forestry in part). But the term agriculture can be understood with a very wide spectrum of activities that are integral to agriculture and have their own descriptive terms, such as cultivation, domestication, horticulture, arboriculture, and vegeculture, as well as forms of livestock management such as mixed crop-livestock farming (Harris, 2014).

The history of agriculture began centuries backed which helped in revolution of human civilization from hunting to permanent agriculture system. For decades, agriculture has been associated with the production of essential food crops. At present, agriculture above and beyond farming includes forestry, dairy, fruit cultivation, poultry, bee keeping, mushroom, arbitrary, etc. Today, processing, marketing, and distribution of crops and livestock products etc. are all acknowledged as part of current agriculture. Thus modern time, agriculture could be referred to as the production, processing, promotion and distribution agricultural products to the market. Furthermore, it can be defined as all forms of activities connected with growing, harvesting and primary processing of all types of crops, with the breeding, raising and caring for animals, and with tending gardens and nurseries. The major agricultural products can be broadly grouped into foods, fibers, fuels and raw materials (such as rubber). The agricultural methods used, may vary in different part of the world. Even cropping systems may vary among farms depending on the available resources and constraints; geography and climate of the farm; technologies available, government policy; economic, social and political pressures; and the philosophy and culture of the farmer.

A small country Nepal of about 14.7 million hectares is located in central himalaya, is sandwiched between the two largest, most populous and economic powerful nations of the world- China and India. Agriculture system has become one of the major component system of Nepali people. Nepalese have practiced agriculture from backed centuries, which was transformed from generation to generation. In general, livestock-based farming systems dominate the mountains, horticulture based farming systems the hills, and cereal-crop based farming systems the Terai. Nonetheless, farming systems are generally mixed, subsistence and dependent on the use of resources from the forest. That's means agriculture system of the country dependent on forest resources. Nepal's agriculture has both opportunities and challenges.

Nepal Agriculture is in a low development stage. Somehow the majority of the population is participate in agriculture, productivity and competitiveness of the sector are low, adoption of improved technology and tools is limited and even though most cultivated area is devoted to cereals, there is a growing food trade deficit and malnutrition and food insecurity is high. Few subsectors such as dairy processing, poultry, tea, vegetable seed and fisheries show dynamism, but overall, these positive signs are not yet enough to lift a large number of people engaged in agriculture out of poverty and make a dramatic dent in reducing malnutrition and assure food security in the nation (ADS, 2014).

Nepal's agriculture have problem of declining its productivity and increasing pressure on land, water and forests. This is further exacerbated by rising human and livestock population, urbanization, haphazard construction of infrastructure. Nepal's agricultural problems and crises are complex to account, which required better understanding of the present status of its agricultural systems in its three major agroecological regions (the mountain, the hill, and the Terai regions) and their interconnections and interdependencies (Basnet, 1995). Nepal's other agriculture problem is land degradation and soil erosion. Livestock rearing is one the major occupation of the Himalaya and Hill region people, which provide meat, milk, wool, and manure and income opportunities. Livestock population pressure resulted in overgrazing and a heavy pressure on the ecology of the country leading to an ecological and environmental imbalance due to an excessive drain on natural resources (Joshi 1992, Rajbhandary and Shah 1981).

Similarly, unplanned and unscientific plotting of land, housing and construction in urban areas is the major threats to the Nepal's agriculture. Climate variations and natural disasters are also major challenge to Nepal's agriculture sustainability. Nepal once a self dependent on its agriculture products and export to other countries but now scenario have been changed and food country has transformed into food deficient. The problem of agriculture in Nepal is thus not only complex, but also greatly concerns the maintenance of an effective balance between development and the environment through a balanced and complementary utilization of existing natural resources (Banset, 1995).

Agriculture is the backbone of the economic system of a given country. In addition to providing food and raw material, agriculture also provides employment opportunities to very large percentage of the population. A stable agricultural sector ensures a nation of food security. Agriculture is the main source of national income for most developing countries. Since agriculture employs many people it contributes to economic development. As a result, the national income level as well as people's standard of living is improve.

Nepal is known as Agriculture country in the world, where it continues to be the mainstay of the economy, providing livelihoods for over 70 per cent of the population

and generating around one-third of GDP. The contribution of agriculture sector (agriculture, forest and fisheries) to GDP is estimated to be 26.98 percent in FY 2018/19. This contribution was 27.59 percent in the FY 2017/18 (MoF, 2018) and 25.8 percent in the FY 2020/21 (MoF, 2021). Nepalese farmer are engaged on subsistence and traditional farming, thus Nepal struggles to produce an adequate supply of food for its citizens. Therefore, there is often doubt about food security inside the country. Each year billion worth of agriculture products are imported from overseas specially India and China, which resulted large trade deficit with them. Nepal is the second richest country in the water resource around globe, but due to lack of irrigation facilities inside all areas, majority of land are cultivated seasonally. Most of the land are leaved barren as in Hill and Himalaya because of low productivity and high cost of cultivation. Lack of knowledge in modern agriculture, poor quality of seeds, lack of irrigation, migration trend from rural to urban, poor access of farmers to agriculture tools and technology, these all reasons are behind in the low productivity of domestic agriculture.

Apple Farming in Nepal: Fruits farming was prevailed in Nepal for decades either for the purpose of consuming or commercial sell. Due to presence of natural and climatic diversity, Nepal offers an opportunity to produce different types of fruits. They are very essential part of the agriculture sector contributing certain value of the total GDP in Nepal. The total fruits production of Nepal including summer fruits, winter fruits and citrus fruits were 976,461 metric ton and yield 8.83 mt/ha in the year 2015/16 while in the year 2009/10 was 706,972 metric ton and the yield 10 mt/ha (ABPSD, 2017). And, the total fruits production was around 1,200,000 metric ton and the yield is about 10 mt/ha for the year 2020 (PMAMP, 2021). Presently, the major fruit crops in Nepal are Mango (Magnifera indica), Banana (Musa acuminate), Mandarin orange, Apple (Malus pumila Mill), Litchi (Litchi chinensis Sonn.), Pear, Sweat orange (Citrus sinensis), Guava (Psidium guajava L.), Jackfruit (Artocarpus heterophyllus), kiwifruit and Papaya (Carica papaya). These crops comprised 88 percent of the total fruit production in 2015/16 (ABPSD, 2017). On a global scale, apple (Malus pumila Mill.) production exceeds 89 million tons a year and is grown on more than 5 million hectors (FAO, 2016). It is a ubiquitous temperate fruit suited also for the Himalayan region. Nepal's apple production is around 5.6 Mt a year and with an average productivity of 7.3 Mt/ha (MoAD, 2015/16; MoALC, 2016/17). For the year 2020/21, the total apple production of the country was 45,000 metric ton and yield 9.5 mt/ha (PMAMP, 2021). This fruit cultivated in the mountain region of the country contributes about 4.2 percent of the total fruit production and occupies 5.08 percent of the total fruit area in Nepal (ABPSD, 2017). For the FY 2018/19, the total apple produced in Mustang, Manang, and Jumla are 5727.0 Mt, 1312.0 Mt and 6799.0 Mt respectively and theirs yields were 12.9 Mt/Ha, 12,5 Mt/Ha and 6.5Mt/Ha respectively (MoALD, 2018/19).

For the first time in Nepal, Agro-Manang Private Limited, Manang, imported Gala, Golden Delicious, and Fuji types from Nischler Company, Italy, grafted on dwarfing rootstock (M9T337), and built a high-density apple orchard (3333 trees ha1) in

2015 (Subedi et al., 2020). Farmers and government agencies became interested in high-density apple after that. These days farmers from both Manang and Mustang are planting high-density apple. PMAMP (Prime Minister Agriculture Modernization Project-Nepal) has prioritized HDP and has been giving subsidized seedlings to boost high-density apple plantation. Farmers' unwillingness to use contemporary technologies, on the other hand, is a difficulty in apple production (FDD, 2017). Farmers were dissuaded by the hefty initial investment required and other technical factors linked with it. The Red Delicious and Golden Delicious are the famous conventional type varieties and Fuji varieties are the high density plant types that are grown throughout the country.

Let's observe the apple growing scenario of the India Himanchal State. The total area under fruits in Himachal Pradesh is about 226799 hectares with a production of 928829 MT of all kinds of fruits. Among all the fruits, apple dominates the fruit production in the State. Himachal Pradesh is India's second-largest apple-growing state, producing considerable quantities for commercial purposes and achieving the title "Apple State of India." The State produces about 6.25 lakh MT apple (2014-15) that constitutes 28.55 percent of the total apple production in the country and produced 7.77 lakh MT during 2016-17. The apple is the state's most profitable crop, accounting for 85 percent of total production and 45 percent of acreage under apple production. The apple fruit, which is cultivated mostly in the State's districts has a market value of around 3700 crore (IRs). The State has planted and produced various varieties of Apple like Royal Delicious, Rich-A-Red, Red Golden, Red Chief, and Oregon Spur and Golden Delicious, and now starts Chinese Gala and Washington Apple from United States (Wani & Songara, 2018).

"An apple a day keeps the doctor away" is an old English proverb that basically explains that consuming nutritious and vitamin fruits everyday keep individual healthier. Apples are consumed worldwide and are commercially cultivated and processed for improving the living standard of farmers. It is also the most significant fruit in terms of production in the high mountain districts of western Nepal (Amgai et al., 2015). Apple is a high value cash crops envisaged by Government of Nepal for agricultural development in the mountainous rural areas (Atreya & Kafle, 2016). The apple plays major role in human nutrition and to generate income and employment opportunities. Despite of that, the trend of apple production has not been increased in Nepal. In addition with increasing demand of it the country has to depend on foreign production (FDD, 2016). The low yield and production could be caused by several reasons: It could be inadequate fertilization or lack of modern cultivation practices resulting poor production (MRSMP, 2016). In this background this study entitled **Microeconomics Analysis of Apple Farming during Covid-19: The Case of Mustang District** explained private and social returns of the farmers involving in commercial apple farming in Mustang District.

1.2 Rationale of the Study

The corona virus disease caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), first identified in December 2019 in Wuhan, China. Since then WHO declared the outbreak a Public Health Emergency of International Concern in January 2020 and a pandemic in March 2020. As of 5 December 2020, more than 65.7 million cases have been confirmed, with more than 1.51 million deaths, 427 million cases confirmed and 5.89 million death (as of 22 Feb,2022) attributed to COVID-19 that is affecting 218 countries and territories around the world and 2 international conveyances (Worldometer, 2020).

The COVID-19 pandemic had, with alarming speed, delivered a global economic shock of enormous magnitude, leading to steep recessions and economic downturn in many countries. The baseline forecasted envisions a 5.2 percent contraction in global GDP in 2020—the deepest global recession in eight decades, despite unprecedented policy support. Per capita incomes in the vast majority of emerging market and developing economies (EMDEs) were expected to shrink that year, tipping many millions back into poverty. The global recession would be deeper if bringing the pandemic under control took longer than expected, or if financial stress triggered cascading defaults. The pandemic highlighted the urgent need for health and economic policy action including global cooperation to cushion its consequences, protect vulnerable populations, and improve countries' capacity to prevent and cope with similar events in the future. In all, the pandemic expected to plunge a majority of countries into recession that year, with per capita output contracting in the largest fraction of countries since 1870. Advanced economies were projected to shrink by 7 percent in 2020, as widespread social-distancing measures, a sharp tightening of financial conditions, and a collapse in external demand depress activity (WB, 2020).

The first case in Nepal was confirmed on 23 January 2020 when a 31-year-old student, who had returned to Kathmandu from Wuhan on 9 January, tested positive for the disease. It was also the first recorded case of COVID-19 in South Asia. Nepal's first case of local transmission was confirmed on 4 April in Kailali District. The first death occurred on 14 May. A country-wide lockdown came into effect on 24 March 2020, and ended on 21 July 2020 (MoH, 2020). Similarly, the second wave phase lockdown was started 29th April 2021 and prevail for four months. The series of lock down caused by COVID-19 disrupt economic activity; Nepal's economy is projected to grow by only 0.6 percent in 2021, inching up from an estimated 0.2 percent in 2020. However, the report forecasts a regional growth expected to contract by 7.7 percent in 2020, after topping 6 percent annually in the past five years before pandemic (WB, 2020).

From this pandemic perspective, Nepalese agro based farming in general and apple farming in particular also had been affecting directly or indirectly. Owing to research, more than 100 farmers are producing apples under apple zone project in Mustang might have highly affected by this pandemic. The pandemic issues related to apple faming in Mustang has been revolving in mind as the researcher was born and grown up in Myagdi (neighboring district of a Mustang). The researcher also has visited

Mustang three times with different purposes (exposure, religious and project based visits) and got a chance to witness beautiful apple gardening. Being neighboring with some Mustang's people, we got an opportunity to taste ample Mustang apple since childhood. To certain degree, the researcher observed an apple farming growth of the district, its transportation and price value gain by apples for more than decade. Besides, primary occupation of my family is agriculture since generation to generations. In this context, there were three rationales behind selecting this study. First, assessing economic and non-economic private returns of the apple farmers really helps to analyze how corona virus pandemic affected economy in household level. Second, examining economic and non-economic social return of apple farming also helps to analyze how corona virus pandemic affected economy in social level. Third, methodologically, this study compared private and social returns of the farmers belonging to different strata or territories (Thasang, and Gharapjhong) and calculated statistical test (mean like frequency analysis, mean differences tests, and multivariate regression models, correlation and normality test).

1.3 Problem Statement

Agriculture is the backbone of the nation economy and its contribution on GDP is crucial. Moreover it serves food supply throughout the year which support on maintain food security. The country has huge potentiality for agriculture development but large amount of Nepalese economy has been expensing for agro imports. Majorities of the Nepalese farmers are involving in agriculture based occupation but the agro imports have been increasing annually as compared to other countries. It was 44.43 billion NRs in fiscal year 2009-2010 but reached into 138.32 billion NRs in last fiscal year (MoF, 2018). During the first eight months of the FY 2017/18, trade deficit has increased by 23 percent to NRs. 713.94 billion. During the corresponding period of the previous fiscal year, such deficit had increased by 47.6 percent to NRs. 580.34 billion (Economic Survey, 2017/18). Large portion of youths have been working in abroad and because of inflation of consumer price, large portions of family economy invested for daily necessities. The country has remittance based economy. The workers' remittance increased by 6.4 percent to $ 3.9 billion in mid- February, 2018 and increased 30.2 percent to NRs.443.36 billion in the review period of 2018/19 (MoF, 2018; NRB, 2019).

It is inevitable to transform agriculture system of the country through the mobilization of skilled and semi-skilled youths in rural areas. Agriculture sector in fact, offering employment to the 1.34 billion people in which most of 70-80 percent of the world's agricultural land is managed by around 500 million family farms who produce >80 percent of the world's food (UN, 2015). Even in Nepal, >78 percent of people living with subsistence farming and poverty, 21.6 percent of people living with extreme poverty and hunger and majorities rural people have little or no access of public service (IFAD, 2015). We know Mustang is leading district in an apple production of the country. Mustang was the first district to introduced apple farming in 1960's.

1.4 Objectives of the Study

- To access economic and non-economic private returns of apple farming during COVID-19 periods.
- To analyze economic and non-economic social returns of apple farming in the study area during COVID-19 periods.
- To analyze the relationship between social demographic characteristics of the respondents and economics of apple farming.

1.5 Hypothesis Testing

Under the inferential statistics, this study had posed the following hypothesis:

- Does the farm lands located around Thasang, and Gharapjhong are suitable for apple farming?
- Does apple farming helped to improve family economy?
- Does the village of respondents (Marpha, Syang and Tukche) matter in believing that apple farming is becoming popular in local, provincial and state level of the country?
- Does apple farming improve the financial condition of respondents (farmer & other stakeholders)?
- Does apple farming contribute in the district tourism promotion?
- Does the pandemic bring negative impact for supplying product?
- Does farmer get any financial support from government during pandemic?
- Does the farmer of district get good price for their apple products?
- Does the farmer are feeling the climate change impacts to the apple farming?
- Does the farmer are getting aid through government and other institutions?

1.6 Significance of the Study

Agriculture is the major occupation of the developing country where more than two third population of the country directly or indirectly involved in it. Not only it provides seasonal employment opportunities but also contribute in the GDP of the nation. Nepal economy based on remittance of migrant's worker where remittance contribute around 28.7 percent. Majority of youth force are in abroad, due to which there is shortage of agriculture manpower in the country. This thesis also aim to finding out the possibilities of apple farming and its contribution to the nation and motivated to those oversees youth to invest in the agriculture in apple farming.

Among deciduous fruits, apple can be considered the most important crop in terms of area, production, and household economy in remote mountain districts of Nepal. Apple is a prominent and one of the important prioritized high value cash crops in the high hills of Nepal (APP, 1995). It is the fourth most extensively produced deciduous fruit crop worldwide (FAO, 2010). Largest productive area under apple in Nepal is found in Jumla district and Mustang District. The finest quality of Mustang's apples in terms crispiness and juiciness has been recognized in domestic and international market. In addition to that, processing liquor from apple so called Marpha Brandy has been popular throughout the country. Similarly, other apple products such as juice, cider and air dried

apple slices are getting good market value among domestic consumers (Khanal, 2014). The agriculture industry of Mustang district especially apple farming contributes to national economy and add value to the tourism of the district. The significant of this study is to highlight the economic contribution of apple farming.

1.7 Limitation and Delimitation of the Study

Due to various constraints, this study was delimited in the following ways:

- The study was based on quantitative approach and case study methodology.
- Focus was given to analyze microeconomics of apple farming in Mustang District.
- This study tested the significant difference between tested variables in which decisions were given based on alpha value is 0.05
- All descriptive hypotheses had been explained without any statistical testing by using descriptive and illustrative methods.
- This study was conducted only two rural municipalities (Thasang, and Gharapjhong) of the Mustang District.
- The required numerical data have been collected from 156 sample respondents and narrative information has been generated from 15 key informants (retailers, transportation stakeholder, technicians, visitors and role model farmers).
- The collected data have been analyzed from the view points of economics of agriculture development theory, agriculture transformation theory and integrated farming theory.

1.8 Organization of the Study

On the basis of its content, information and material, this study has been organized into five chapters. First chapter has dealt with introduction, second chapter has focused on literature review associated with this study and third chapter has presented methodological information. Subsequently, Fourth chapter has dealt with data analysis (research objective 1 to 3). Finally, Fifth chapter had presented gist of the study that include discussions of findings, discussion, conclusions, possible implications and future direction as well.

CHAPTER II

LITERATURE REVIEW

2.1 Thematic Review

Nepal, a small country of about 14.7 million hectares, is sandwiched between the two largest, economic giant and most populous nations of the world- China and India. Located between 80° 15' and 88°10' E longitude, and 26° 20' and 30° 10' N latitude, the Nepal was founded in the late 18th century by late King Prithivi Narayan Shah (Basnet, 1995). Nepalese agribusiness is marked by grater level of diversification and geographic varieties. Due to the high range of elevation and temperature all throughout the nation, farming in Nepal has peculiar characteristics.

Agriculture is still a key economic activity for people in the rural area, and more than two-thirds of rural people depend on agriculture for their livelihood (Chapagain, 2015). Crops and livestock farming, in different combinations, form a major way of life sustenance in the rural communities. Cereals crops, including rice, wheat, maize, millet, barley, and buckwheat, are the foundations of Nepal's agriculture, especially in western Nepal (Joshi, 2018). The agriculture sector accounts for almost one third of Nepal's GDP. Sixty percent of the farmland is rain-fed in nature, without any alternative irrigation measures (Chapagain, 2015), and over 50 percent of Nepalese farmers are smallholders, cultivating less than 0.5 ha (CBS, 2011). Twenty-Year Agricultural Development Strategy has been implemented since FY 2016/17 with the goal of making the country self-dependent on food by the year 2035 through increasing agricultural production and productivity, making arrangements for storage, making processing and distribution system more effective, increasing employment through the development of competitive and commercial agricultural system, maintaining food and nutrition security, and conserving of sustainable environment (MoF, 2018/19).

More noticeably, the first periodic plan 1956-1961, identified agriculture as one of the favorable and promising sectors for poverty reduction. Since the formulation of fifth five year plan (1975-1980) to tenth five year plan (2000-2005), the prime priority for poverty reduction was given to agriculture through increasing productivity of the existing crops, expanding agriculture market and diversified production of horticultural crops (DOA, 2018). Agriculture Perspective Plan (1995-2015), arguably the first comprehensive sectoral plan; identified agriculture sector as engine that drive for growth. It foresee a multiplier growth effect of agriculture sector to other sectors of economy and envisioned input-output model of agriculture growth and identified fertilizer, technology, rural infrastructures and irrigation as major factor inputs for achieving broad based agriculture growth and country prosperity (DOA, 2018).

Prime Minister Agriculture Modernization Project (PMAMP) has been implemented since FY 2016/17 as a complementary project of Agricultural Development Strategy with the aim of modernization of agriculture through different activities such as arrangement of advanced agricultural technology and production inputs, mechanization in the production of crops and materials, and arrangements of necessary infrastructure for

processing and marketing (MoF, 2018/19). Under Prime Minister Agriculture Modernization Project (PMAP), 6,742 Small Commercial Agricultural Production Centers (Pocket), 1,227 Commercial Agricultural Production Centers (Block), 177 Commercial Agricultural Production and Processing Centers (Zone) and 16 Large Commercial Agricultural Production and Industrial Centers (Super Zone) have been established. Provisions for grants have been arranged under different titles required for agricultural production including fertilizer, seed, and irrigation equipment, construction of pond for fishery, and crop and animal insurance. In addition, grants have been mobilized for carrying out different programmes through local levels on various areas of agriculture system in public-private partnership including infrastructure development of agricultural marketing (MoF, 2018/19). Apple farming in Nepal started in kali Gandaki valley before the 1960 but first commercial Apple farming in Nepal started at Marpha, Mustang when Horticultural Farm was established and introduced new varieties of apples and production methods in 1966. The total volume of apple produced was 31,386 Metric ton in 4349 hectare in the year 2018/19 (MOALD, 2020).

2.1.1 Contributions of Agriculture on National Economy

Agriculture has been an important sector in the national economy for most of the developing countries (Mongues, et al., 2012) while it plays an important role virtually in all social and economic activities of any country (Lawal, 2011). "It is the agricultural sector that the battle for long-term economic development will be won or lost"-Gunnar Myrdal, Nobel Laureate in Economics. Nepal is predominantly an agrarian economy. It is the main source of livelihood of the Nepalese people. Still 74 percent of the people are dependent on agriculture sector. This sector contributes for about 35.0 percent of the GDP. Nepalese economy has undergone a gradual structural shift in the recent years. The share of service sector has increased gradually and reached nearly half of the GDP that was highest (5.8 percent) annual percentage change in 2007/08 and lowest (2.8 percent) annual percentage change in 2006/07 (see in Appendix D, Table 1).

Apple farming has been generating significant economy of the countries globally in which China produced more than 42 million tons in the year 2019 (see in Appendix D, Table 2). Nepal produced 31,386 metric ton cultivated in area of 4,349 hectare in FY 2018/19. Karnali Province dominate with producing 15,388 metric ton apples cultivated in 2331 hectare followed by Gandaki Province producing 7,450 metric ton apples cultivated in 632 hectares (see in Appendix D, Tables 3 and 4). More specifically, Jumla district is the major producer which produced 6799.0 metric tons cultivated in 3670.0 hectare, followed by Mugu with 2799.0 metric tons from 943.0 hectare, Kalikot 1794.0 metric tons, Dolpo 1696.0 metric tons and Humla 1468.0 metric tons. From Gandaki province, Mustang produced 5272.0 metric tons cultivated in 1257.0 hectare and Manang produced 1312.0 metric tons from 220.0 hectare. Likewise, Solukhumbu, Terathum and Khotang districts from Province 1, produced 1180.0, 467.0 and 469.0 metric tons of apples. From Bagmati province, Rusuwa produced 424.0 metric tons apple cultivated in

87.0 hectare. Similarly, from Sudhur Paschim province, Bajhang produced 997.0 metric tons from 284.0 hectare, Bajura produced 529.0 metric tons from 211.0 hectare and Baitadi produced 486.0 from 215.0 hectare (see in Appendix D, Table 5).

2.1.3 Food Security and Agriculture Development

"Hunger is on the rise: Food security is inevitability for rural prosperity and sustainability". This slogan indicates that food security is becoming global agenda even in 21st century. There are more than 821 million hunger people in the world (WFO, 2018). Hence, international agencies, partners international and national government aiming to foster agriculture development and food security activities through the collective efforts of public, private and cooperative sectors.

Food security concept has evolved in the last forty years to reflect changes in policy making level (Clay, 2002; Heidhues et.al, 2004). In the mid-1970s, the term was first originated in the global debate when the World Food Conference (1974) defined food security in terms of food supply and price stability. WFC (1974) defined Food Security as *"Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices"*. FAO (1983) stated food security as "Ensuring of both physical and economical access by people at all times to the basic food they needed". This definition was based on the balance between demand and supply side of food equation. Food security is a condition when all people at all times have access to sufficient, safe and nutritious food to maintain a healthy and active life (FAO, 2003).

World Food Summit (1996) described "*Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"*. The widely accepted WFS (1996) definition strengthen the multidimensional nature (characteristics) of food security and comprise food access, availability, food utilize and stability. The concept of food security has four pillars (availability, access, utilization and stability:

→ Food Availability: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).
→ Food Access: Access by individuals to adequate resources for acquiring appropriate foods for a nutritious diet.
→ Food Utilization: Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met.
→ Food Stability: To be food secure, a population, household or individual must have access to adequate food at all times. There should not risk of losing access to food as a result of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

Besides, food insecurity prevails if both food supply and demand are sufficient to cover food requirements on a stable basis. Similarly, food insecurity prevails if at any time; occasionally or permanently food supply or demand fall short of requirements (see in Appendix D, Table 6). The widely accepted World Food Summit (1996) definition strengthen the multidimensional nature (characteristics) of food security and comprise food access, availability, food utilize and stability. Base on it, policies on promotion and recovery of livelihood options are response. Livelihood approaches are now fundamental for international organizations, development programmes, policy makers (Chambers & Conway, 1992). This approach is being used in the context of risk management, risk coping and concept of vulnerability.

The UN Declaration of Human Rights in 1948, first recognized the new concept of the Right to Food. The formal adoption of the Right to Adequate Food considered a significant milestone accomplishment by WFS delegates in 1996. Till this date, over 40 countries have the Right to Food enshrined in their constitution (McClain, 2004). The right to food is not simply a right to a minimum ration of calories, proteins and other specific nutrients. It is a right to all required nutritional components that an individual required to live active and healthy life and to the means to access them (UNHR). The right to food described by Committee on Economic, Social and Cultural rights as when every individual (men, women, child) alone or in community with others, has physical and economical access at all times to adequate food or means for its procurement. The Nepal's new constitution promulgated in 2015, has enshrined the Right to Food as a fundamental rights for its citizens. There is explicit constitutional recognition of the right to food, and other related provisions in articles 36 and 42:

- Article 36 (1) ensures right to food for every citizen.
- Article 36 (2) ensures that every citizen have the right to be protected against food scarcity that may cause threat to life
- Article 36 (3) ensures that every citizen have right to food sovereignty as provide by law
- Article 42- right to social justice-includes provision on food.

FAO Policy Priorities for Food Security: FAO's 'twin-track approach' for fighting hunger includes both sustainable agricultural and rural development with targeted programmes and actions for enhancing direct access to food for the most needy. As outlined in table below, the recovery measures for establishing resilient food systems for needy is addressed by the first track (see in Appendix D, Table 7). The structure of the food economy as a whole, as well as its components such as agricultural production, technology, the diversification of food processing, markets and consumption are the factors that affect food system resilience. Track two measures the available options for providing assist to vulnerable groups.

Nearly a billion people who work in agriculture and more than 500 million family farms, which produce more than 80 percent of the world's food, have contributed to better health and nutrition of the global population (UNHDR, 2015).. The global food

security index is based on 59 unique indicators across 113 countries. Finland secured top country for food security in 2020, ahead Ireland and Netherlands United Kingdom was ranked in 6th while the United States and Canada ranked in 11th and 12th respectively (see in Appendix D, Table 8).

Hunger and Food Insecurity

Hunger and Food Insecurity are interlinked to each other. One factor results the other and vice versa. Food and Agriculture Organization (FAO) leading institution of UN strives to eradicate hunger, food insecurity and all forms of malnutrition. According to FAO, hunger is an uncomfortable or painful physical sensation caused by insufficient consumption of dietary energy. Around 690 million people are in state of hunger in the globe. FAO applied Prevalence of Undernourishment to access hunger in the world, thus "hunger" could be referred to as undernourishment. The Prevalence of Undernourishment (PoU) is tool to monitor hunger status in regional and global level, and is based on food availability, food consumption, calories an individual needed. Using PoU approach, FAO estimated around 690 million of hungry people in the world.

Food insecurity is worst situation when people lack of regular access to enough safe and nutritious food for normal growth and development and active and healthy life. This situation may be due to unavailability of food, lack of resources to obtain food, poor quality of available food. Food insecurity experienced at different levels of severity. Based on the Food Insecurity Experience Scale (FIES), the prevalence of moderate or severe food insecurity in the population is estimated. It is an estimation of percentage of a country's population that faces difficulties in reaching enough safe and nutritious diet for normal growth and development and an active and healthy life (fao.org).

Moderate food insecurity is an environment where the quality and /or quantity of people food reduced and they are uncertain about their ability to gain food due to lack of money and other resources. People experiencing severe food insecurity have run out of food and, at the most extreme, spent days without eating. This kind of situation is terrible to experience by people and there is high risk of malnutrition to such individual (fao.org). Nepalese economy has been expensing for agro imports. Majorities of the Nepalese farmers are involving in agriculture based occupation but the agro imports have been increasing annually. The import was 44.43 billion NRs in fiscal year 2009/10 but reached into 138.32 billion NRs in fiscal year 2017/18 (see in Appendix D, Table 9). Agro based imports of the country have been mounting annually as compared to agro based exports. It has thus created trade deficit. During the first eight months of the FY 2017/18, trade deficit has increased by 23 percent to NRs. 713.94 billion. During the corresponding period of the previous fiscal year, such deficit had increased by 47.6 percent to NRs. 580.34 billion (Economic Survey, 2017/18) (see in Appendix D, Table 10).

According to the Global Food Security Index (GFSI), Switzerland is in first rank, while our neighboring countries such as India and China are in 47 and 77 rank respectively. Being an agricultural country, Nepal is in 82th rank in food security, which

symbolizes that only few people are involved in agriculture as their main profession. In case of highly food secure, mildly and severely food insecure households in federal Nepal, the Gandaki Province has highest food secure household (i.e. 56 percent) with 16 percent mildly food insecure household followed by 6 percent household suffering from severe food insecurity. Likewise, Bagmati Province and Provine 1 have either or above 50 percent of food security status followed by Province 5 and 2 with food secure household status at 48 percent and 44 percent respectively. The situation of Karnali Province and Sudhurpaschim Province seems problematic. Province 7 has only 38 percent of food secure household with 18 percent mildly food insecure and 12 percent severely food insecure household. But the status of province 6 is extremely critical. It only has 22 percent food secure household followed by only 18 percent household being both mildly and severely food insecure (see in Appendix D, Table 11). In this line, Global Hunger Index (GHI) (2019) report states that hunger index of Nepal is improving. Nepal secured 73 ranks among 117 countries. The hunger index is becoming critical in 43 countries especially in South Asia and Africa and severely in 46 countries (Li-Bird, 2019).

2.2 Theoretical Review

2.2.1 The Economics of Agriculture Development

This theory propounded by John Mellor has owned the American Agricultural Economics Association award for its lasting value on agriculture development. Mellor uses economic analysis to organize, extend, understand, and evaluate the economic facts of the agricultural sector in developing countries. He highlights the interaction between agriculture and the rest of the economy i.e agriculture and foreign exchange, agriculture and capital formation and alternative uses of industrial capital (Mellor, 2017). The two big ideas of this theory are; the rapid growth of small commercial farmer dominated agriculture accelerates the economic transformation and is essential to the rapid decline in dominantly rural poverty and government has a prominent role if small commercial farmer dominated agriculture is to grow rapidly.

Role of agriculture are listed below:
- Special Characteristics of the Agricultural Sector
  - Some 40 to 60 per cent of the national income is produced in agriculture and from 50 – 80 percent labor force is engaged in agricultural production
- Agriculture's Contributions to Economic Development
  - Economic development is characterized by a substantial increase in the demand for agricultural products
  - Expansion of exports of agricultural products may be one of the most promising means of in- creasing income and foreign exchange earnings
  - The labor force for manufacturing and other expanding sectors of the economy must be drawn mainly from agriculture.

14

o Agriculture, as the dominant sector of an under developed economy, can make a net contribution to the secondary industry

o Rising net cash incomes of the farm population may be important as a stimulus to industrial expansion

The determining variables are listed below:

- Expenditure by the small commercial farmer: The magnitude of increased income to the small commercial farmer from modernization and its expenditure on non-farm
- Relative size of the rural non-farm sector: The size of the rural non-farm sector relative to the small commercial farm sector and the absolute size of both
- Employment elasticity by sector: The employment elasticity of each rural sector through production plus

o A ten percent increase in production of that sector's goods and services results in a nine percent increase in employment

o Fully consistent with Lewis's (1954) seminal position of "unlimited supplies of labor

This theory suggested modernizing following areas:

- Physical infrastructure, rural education and health
- Prices and price policy and purchased inputs
- Research and extension
- Finance for the small commercial farmer
- Cities, consumption, and marketing dynamics
- The role of foreign aid

For the modernization the role of government must be:

- Vision and strategy from the highest level
- Government responsiveness to the small commercial farmer
- Scarcity of resources and consequent priorities
- Removing government presence
- Corruption
- Local government
- Geographic concentration

2.2.2 Theory of Agriculture Transformation

Nobel laureate economist (in 1979) Theodore William Schultz emphasized that key to agricultural transformation lies in emphasizing technological change in agriculture (Author & Lekhi, 2008). According to the conception of this theory, Schultz doctrine (Table 13) has given focus on following assumptions (Lekhi, 2008).

- Lack and availability of the capital is another reason and he thinks that peasants are more effective in producing output per additional unit of capital input.
- Given the enormous productive potential of agriculture, he stresses that poor countries with large agricultural sectors should allocate more resources to agriculture.

- Schultz does not belittle the importance of industrial sector but he wants the removal of those biases which stand in the way of transfer of resources from rural to urban areas.
- He further recommends that manufacturing and other urban sectors should not be subsidized with massive resource transfer of from rural to urban areas.
- Agriculture as a tool of employment-based strategy requires three elements (Accelerated output growth through technological, industrial and price incentive changes to raise the productivity of small farmers; raising domestic demand for agriculture output and diversified and non-agriculture labor-intensive rural development activities).

Table 1: *Old and Modern Doctrine for Agriculture Transformation*

Old doctrine of agriculture	Views of Schultz
Misallocation of land resource	Meaningless to provide sufficient land to the farmers who are bounded by traditions
Zero marginal productivity	It is because of traditional agriculture
Farmers do not accept change as they are handcuffed by traditional thoughts	Farmers are not change resistant only their yield can be connected by profits

Source: Lekhi, 2008

This transformation is possible with the key transformation policies such as ability/skills of the farmers, access to credit capital, crop insurance to protect risk, expansion of marketing facilities, ensure direct payment to the farmers need stable price policy. In this theoretical background, the collected data will be interpreted so that the findings can be generalized

2.2.3 Integrated Farming System

Full integration of agricultural systems at the producer or community scale may help in slowing or reversing some of the detrimental environmental and economic problems associated with specialized industrial agriculture. Modern agriculture requires intensive inputs (John et al., 2008). However, the use of forages and other diverse crops in the crop rotation can reduce intensive inputs while in some cases increasing crop yield enhancing nutrient cycling reducing plant disease and improving soil quality. Integration of livestock and cropping systems has the potential advantages of enhancing nutrient cycling efficiency, adding value to grain crops, and providing a use for forages and crop residue. Integrated crop/livestock producers traditionally have raised a greater diversity of crops, encouraging crop rotation and have allowed livestock to convert low- quality crop residues or failed crops into higher value protein. Integrated agricultural systems are not new (John et al., 2008).

FSR (Farming System Research) component Integrated Farming System (IFS): IFS promotes a change in farming practices for maximum productivity in the cropping pattern while also ensuring optimal resource utilization. In the IFS, farm waste is better

recycle for beneficial purposes. Unlike the SFS, the IFS concentrates its efforts on a small number of interdependent, connected, and frequently interlinking production systems based on a few crops, animals, and associated sub-professions. IFS envision enhancing total productivity, sustainability, and meaningful employment by leveraging complementarities and synergies across various agricultural sub-systems/enterprises (Rana and Chopra, 2013). The integrated farming system is a component of a farming strategy that aims to ensure the sustainable use of natural resources for current and future generations (Preston 1995).

The number of commodities produced per farm has decreased from five in 1900 to approximately one in 2000. Integrating forage, crop and livestock systems can spread economic and production risks over several different enterprises, thereby taking advantage of a variety of agricultural markets. As an example, incorporating forages into a Canadian cropping system potentially reduced risk more than participation in government programs. There are also potential environmental benefits to integrated systems. Research in Norway indicated that runoff of N and P was linked to the amount of ley in the system. In New Zealand cropping systems, 2–4 years of grass-clover swards resulted in large net N input and increased soil aggregate stability, soil porosity, and earthworm activity. Soil properties rapidly declined during the subsequent 2–4 years of crop production. Recently, some US producers have adopted more diversified management systems that include crops and livestock. However, operators of integrated production

Integrated agricultural production systems are agricultural systems with multiple enterprises that interact in space and/ or time and the interactions result in a synergistic resource transfer among enterprises. These systems differ from dynamic agricultural production systems because there is interaction between different enterprises and the synergistic resource transfer between enterprises. An example of an integrated agricultural production system may be an integrated crop–livestock production unit where manure from livestock is added to crop land and at least a portion of the grain grown on the farmer the Stover (crop residue) is fed to livestock. Manure from livestock can replace some of the fertilizer inputs. Feeding grain to livestock or allowing them to use crop residues can potentially add value to the grain or crop residue.

Figure 1. Principles of Integrated Farming System

```
┌─────────────────────────────┐          ┌─────────────────────────────┐
│      Producer's Goals       │          │      Exogenous Factors      │
│                             │          │                             │
│   → Production              │          │   → Weather/climate         │
│   → Economic                │          │   → Market condition        │
│   → Social                  │  ┌─────────────┐   → Government program │
│   → Environmental           │  │  Influence  │   → New Technology     │
│   → Personal                │  └─────────────┘                       │
└─────────────────────────────┘          └─────────────────────────────┘
                                      ▼
                        ┌─────────────────────────────┐
                        │     Management Concern      │
                        │                             │
                        │   → Crop yield quality      │
                        │   → Net returns             │
                        │   → Pest management         │
                        │   → Soil, water and air     │
                        └─────────────────────────────┘
                                      ⇓
            ┌─────────────────────────────────────────────┐
            │  Dynamic integrated agriculture system      │
            │                                             │
            │  Economic viability and social acceptability│
            └─────────────────────────────────────────────┘
```
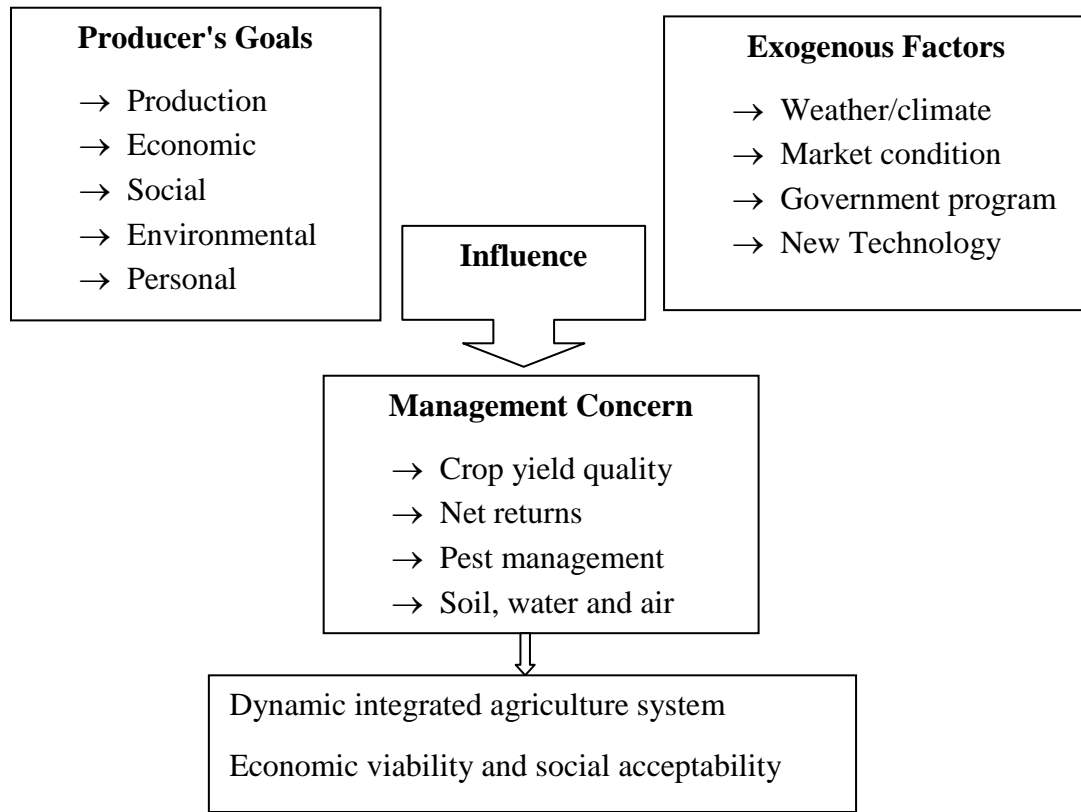
Source: John et al., 2008, p. 267

2.3 Policy Review

Policy reforms and economic growth across the globe have been changing demand and supply fundamentals sufficiently to turn agriculture into a more market-driven sector which provides investment opportunities, particularly in developing countries (OECD, 2013). In Nepal, agricultural development is widely acknowledged as a critical component in a strategy to boost livelihoods of the rural people and is now seen as an important part of any development strategy. Hence, Government of Nepal has accorded top priority to agricultural growth for the improvement of living standards since the inception of a planned economy in 1956 (Thapa, 2009).

Agricultural Perspective Plan (APP) (1997-2017) is first long term vision to increase agricultural productivity that stresses priority inputs (irrigation. rural roads, fertilizer and agricultural technology) to achieve priority outputs (increased production of fruits, vegetables, livestock, forestry and promotion of agri-business). The APP was designed to promote about 5 percent annual agricultural growth in order to achieve poverty alleviation goals set by the Government. It has emphasized applying modern technology as major priority input in farming system of the country. Since many years there has been a surge of interest and debate in public forum about the need to increase

public sector investment in agriculture, and policy reform for agricultural development in Nepal. Recently, Government of Nepal has prepared Agriculture Development Strategy (ADS), a 20-year strategy paper for agriculture sector development jointly collaborating with technical assistance (TA) team, financial support mainly from ADB, co-financed by IFAD and contributions by EU, FAO, SDC, and JICA (MoA,2014).

ADS aimed to allocate significant budget in agriculture sectors, intended to implement various capacity building, rural infrastructure development and research and agriculture development projects in coming future. Subsidies will be provided to small and marginal farmers. Government can draw other public and private sector investment by creating favorable investment climate to attract corporate investors in other sub-sectors in future. Large scale private investment in transfer modern technologies in farming system as well as create forward and backward linkages between urban and rural areas is essential (MoA, 2012).

"A self-reliant, sustainable, competitive, and inclusive agricultural sector that push economic growth and contribute to improved livelihoods and food and nutrition security" were the ADS 2014 vision (ADS, 2014). The ADS strategic frameworks are food and nutrition security, poverty reduction, agriculture trade competitiveness, higher and more equitable income and farmers' right ensures and strengthens through collective efforts of farmer organizations, cooperative organizations and private sector organizations (ADS, 2013). According to strategic framework ADS also has developed and implementing Prime Minister Agriculture Modernization Program (PMAMP). It has emphasized on four types of production, processing and industrial centers have been determined by Pocket, Block, Zone and Super Zone in order to commercialize the agricultural sector. The PMAMP has been conducted in total 143,300 hectare area including 69,600 hectare land area in the FY 2016/17 and 73,700 hectare land area in the first eight month of the current FY. The federal budget for FY2019 hence aims at expanding the "PMAM" (2016-2025) to boost agricultural productivity (ADB, 2018).

Table 2: *Agriculture Development Programs in Different Plan Period*

Plan	Periods	Agriculture Development Programs in Nepal
1Plan	1956-61	• Tribhuvan village development program implemented in 150 blocks • Rs 45 million (13.6 percent of total budget) was allocated and benefited to 2.25 million people from 3800 villages
2 Plan	1962-65	• Developed and implemented Land Reform Act 1964
3Plan	1965-70	• Diffusion of improved technology for agriculture development
4Plan	1970-75	• Prepared specific policy for agriculture development
5Plan	1975-80	• Implemented Integrated Rural Development Program (IRDP) • Agriculture development became first priority sector in IRDP
6Plan	1980-85	• Continuation of IRDP • Realized IRDP as strategy for rural development

Plan	Periods	Agriculture Development Programs in Nepal
7Plan	1985-90	• Realized role of women in agriculture development (WID) • Prepared and implemented irrigation policy for agriculture development
8Plan	1992-97	• Mobilized women in agriculture development (WAD) • Mobilized local government in agriculture development process
9Plan	1997-2002	• Promoted local technologies for agriculture development • Realized gender role of women in agriculture development (GAD)
10Plan	2002-2007	• Implemented OBOP for agriculture development • Promoted specialized and commercialized farming system
Interim Plan	2008-10	• Rural Urban Partnership Program • Commercialization of agriculture products
Interim Plan	2011-13	• Focus on agro-tourism development activities • Government offered vocational trainings to >2,00000 youths by mobilizing 16 training institutions
13 Plan	2013-16	• Upgrading country to developing country by 2022 and middle income country by 2030
14 Plan	2016-18	• Designed/implemented PMAMP • Agriculture production in pockets, blocks, zones and super zones • Agriculture as lead sector for economy (now to then and forever)
15 Plan	2019-21	• Continued PMAMP • Priority given to agriculture development strategy (2015-35) • Ensure food security and nutrition through agriculture development

Source: NPC, 1956, 1962, 1965, 1975, 1980, 1985, 1992, 1997, 2002, 2010, 2016, 2019

2.4 Empirical Review

The Oxford English Dictionary (1971) defines agriculture very broadly as "The science and art of cultivating the soil, including the allied pursuits of gathering in the crops and rearing live stock (*sic*); tillage, husbandry, farming (in the widest sense)."

Agriculture could be defined as the system of soil cultivation and the feeding and the management of crops and livestock for the human use. Also, it is the raising process of useful plants and livestock under the management of man (Rimando, 2004). Agriculture is the deliberate endeavour to alter a portion of Earth's surface through the cultivation of crops and the raising of livestock for food or economic gain (Rubenstein, 2003).

Agriculture sector set the base and ground root for overall development of the country. The sector play vital roles to increase income alleviate poverty and uplift living standard of Nepalese people. Recent evidence and data from the respective institutions and agencies consistently shows that agricultural growth is highly effective in reducing poverty to certain extent. The contribution of agriculture in food, raw materials, and financial surplus including foreign exchange can be observed in positive direction. World Bank (2008) report that Gross Domestic Product (GDP) growth originating in agriculture is about two times more effective in reducing poverty than GDP growth originating outside the sector. Stringer (2001) argues that the agricultural sector performs important social welfare functions in developing nations. For example, during an economic downturn or an external income shock or financial crisis, agriculture can act "as a buffer, safety net, and as an economic stabilizer.

Apple is a fruit of temperate climate and native in many parts of Europe and Asia Worldwide, apple is the fourth most extensively produced deciduous fruit, in 94 countries its production was 69.60 million metric tons fresh-weight yield from 4.85 million hectares of land (Anon., 2010). Apple is rich in nutrients, especially in vitamin C, but is bulky of nature with a relatively limited shelf life (Boyer & Liu, 2004). Therefore, these fruits are mostly consumed fresh but some is processed into juice, dried apple slices and other products. It must be remarked that apples were one of the most produced and consumed fruits in the globe which can be farmed in temperate areas and has a vital roles for world agriculture (Ucar *et al.*, 2016). So without doubt, it is commercially the most considerable temperate fruit and the widely produced fruits in the world after banana, orange and grape and one of the best traded fruit in the world (FAO, 2016); (Wang *et al.*, 2016).

Apple in farmed and cultivated in northern part of the country and Nepal itself is a mountainous country. According to SNV (2011), due to its remoteness and its tough topography, small units of productions have been isolated from bigger market places because they have little access to infrastructure such as road, irrigation, and storage facilities. Apple production in Nepal is increasing but at a very slow rate and mostly due to increased area under cultivation and not increased productivity (Thapa *et al.*, 2004). The review works show sans important of analyzing private and social returns of the farmers involving in apple farming especially in Mustang District. The district is popularly known as apple zone where 100+ farmers are directly getting technical and financial supports form the Prime Minister Agriculture Modernization Program.

CHAPTER III

RESEARCH METHODOLOGY

3.1Research Design

Research design not only explains the methodology being applied in the study but also helps to construct appropriate method in order to address research questions that are established to examine social phenomena (Scotland, 2012). This study applied quantitative approach which assumes the conditions of the true experiment in different setting without controlling and manipulating of the studied variables (Sharma, 2007). More specifically, this study would apply comparative case studies within multiple site (Thasang and Gharapjhong) for interpreting experiences of the participants that explain microeconomics of apple farming through detailed in depth data collection, understanding social process and linking causes and outcomes of novel corona pandemic impact (Yazan, 2015).

More so, this study had also triangulated qualitative information with quantitative data. For that purpose this study generated reflective narrations from about 15 participants belonging to apple farming activities. The characteristics of narratives are that they have a plot and characters, they deal with specific situations rather than generalizations and they occur within a social and cultural context that is made explicit. A narrative should also reveal a sense of human agency and intention (Shulman, 1992 as cited in Dawson, 2007). Thereby, narrative research aimed for its finding to be well grounded and supportable its aims for verisimilitude, producing results that have appearance of truth or reality (Webster & Mertova, 2007, p. 10).

3.2 Selection of Study Area

According to MoAD (2015/16), more than 50 districts in Nepal are now growing apple, among which 12 are major and in mountainous regions. We selected the most important area, Mustang district (957 ha) (MoAD, 2015/16) which is famous for its delicious apple and its charismatic blooming tourism. Mustang district lies in Gandaki province and is known as the district across the mountains as it lies in the Trans Himalayan region in the North of Central Greater Himalaya named as Annapurna and Dhaulagiri ranges and surrounded by Tibet Autonomous Region of China. Besides apple, Mustang is also known for its scenery, religious and cultural significance, and transportation accessible and has good position in tourism, which adds up a market potential for apples produced in this district (Kadka, 2019).

The district is located in between 28°20' to 29°5' N and 83°30' to 84°15' E and the altitude ranges from 1640 to 7061 m above sea level. Mustang receives an average of less than 260 mm rainfall annually as recorded in lower Mustang, Jomsom. This district experiences an average minimum temperature of -2.7°C in the winter and an average maximum temperature of 23.1°C in the summer. It covers an area of 3563.21 sq.km of which 57.7 percent is barren land, 30.26 percent is grassland, 2.91 percent forest, 1.6 percent cultivated land and rest others (KC et al., 2014). Mustang has total population of

13,452 (Male: 7,093, Female: 6,359), total land area of 3,573 sq KM and total households of 3,354 as per 2011 population census (CBS, 2011).

The total number of apple produced in the district in the year 2018/19 was 5727 metric ton in 445.0 ha (MoALD, 2017/18). In 2017, Ministry of Federal Affairs and Local development restructured the district into five Gaupalikas or Rural Municipalities. The five Rural Municipalities are: Thasang Rural Municipality, Gharapjhong Rural Municipality, Barahgaun Muktichhetra Rural Municipality, Lo-Ghekar Damodarkunda Rural Municpality and Lomongthang Rural Municipality. But the research prime focused on three Rural Municipalities viz. Thasang, Gharapjhong and Barahgaun Muktichhetra Rural Municipality where climate is suitable for apple farming. Due to time constraint and Covid-19 lockdown, we managed to research on Thasang and Gharapjhong Rural Municipality, where, we missed out Barahgaun Muktichhetra municipality. The field study was carried out from 12th Sep 2021 to 18th Sep 2021.

3.3 Nature and Sources of Data

This study applied both primary and secondary sources of data. The primary data and information were collected from structured questionnaire, interview guideline and observation checklist as well as personal communication. Likewise, required secondary data were collected from books, international journals, published and unpublished reports, theses and seminar papers as well.

3.4 Sampling and Population

As it is not always possible to reach to the population of the study, samples are proportionate subset of the population. Sample is a small representative proportion of population that will select for observation and analysis of data information (Best & Khan, 2004). Under quantitative approach, this study identified 175 sample populations. Out of that only 156 sample numbers or respondents was selected that are generated with 95 percent confidence level and 5 percent marginal error by using sample size determination formula[1] (Krejcie & Morgan, 1970). In so doing, this study followed both purposive and stratified random sampling methods. Likewise, under qualitative approach, this study selected 15 participants who can reflect on researching issues.

---

[1] $Sample\ size\ (n) = \frac{\chi^2 * N * (1-P)^2}{ME^2 * (N-1) + \{\chi^2 * P * (1-P)\}}$

Where,

n = required sample size

χ^2 = Chi square (Value* 3.842 for 5percent confidence level with 1 degree of freedom)

N = Population size

ME = Desired Marginal Error

P = Probability of Success (0.5 value for unknown population)

Q = (1-P, i.e. 0.5 value for unknown population)

Table 3: *Selection of the Respondents*

Strata	Respondents (Village)	Sample Population	Sample Number
Thasang Rural Municipality	Tukche	50	48
Gharapjhong Rural Municipality	Marpha	75	60
	Syang	50	48
Total		**175**	**156**

Source: Field Study, 2021

3.5 Data Collection Techniques and Tools

This study applied household survey, observation and key informant interview techniques for data collection. Survey is a method of collecting data in which a specifically defined group of individuals are asked to answer a number of questions (Baker, 1994, p. 172). Questionnaire survey is the most commonly use method in every kind of research. It is used to gain primary information from the respondents who answer questions about themselves, their knowledge of particular subject and their opinion. The questions in the questionnaires are well structured so that each respondent answers in exactly the same way. This enables the researches to compare the quantities ways. This method is applied to collect data from 156 selected respondents based on structured questionnaires (Cronbach's Alpha value 0.746).

3.6 Reliability and Validity

For reliability, this study applied internal consistency measure or cronbach alpha measurement that provides a coefficient of inter-item correlations that measures the internal consistency among the items* (Cohen et al., 2007).

*Alpha= nrii /1+ (n−1) rii

n=the number of items in the test or survey (e.g. questionnaires)

rii =the average of all the inter-item correlations.

For example, if the number of items in the survey is ten, and that the average correlation is 0.738. This study used cronbach alpha test through pilot testing that was conducted in Annapurna Rural Municipality of Myagdi District before collecting data from the field. When I found alpha value as weaker internal consistency or less than 0.8, then I had to revisit the tools. Similarly, validity refers to apply valid process during whole research process. Validity can be improved through content, construct and criterion validity (Cohen, et al., 2007). In this study, I had employed both types of validity during researching process. More so, content validity help researcher to attempt careful sampling and measure significance test between variables. Similarly, construct validity helped researcher to triangulate my literature review, field data information and statistical tools like factor analysis. And finally criterion validity helped researcher to use reliable tools for data collection.

3.7 Method of Data Analysis

By using SPSS version 20, this study adopted descriptive and inferential statistical methods of data analysis. Under descriptive analysis the statistical tools such as frequency table, cross tabulation, central tendency was applied. Similarly, interferential statistical tools like; likert scales analysis; relationship test, correlation and multivariate regression have be applied (Field, 2009). Similarly, this study also applied description, analysis, and interpretation methods of data analysis (Yin, 2014). Description method helped to understand the meaning of the data. Analysis method helped to identify underlying meanings of data to make a systematic description. Interpretation method helped to understand processes and meanings in the theoretical context.

CHAPTER IV

DATA ANALYSIS AND PRESENTATION

4.1 Characteristics of the Respondents: General information

Table 4: General Information of the Respondents

Indicators	Variables	Frequency	Percent
Rural municipality	Ghoropjong R.M	108	69.2
	Thasang R.M	48	30.8
Village	Marpha	60	38.5
	Tukche	48	30.8
	Syang	48	30.8
Age	Up to 40 years	20	12.8
	41 to 60 years	90	57.7
	More than 61 years	46	29.5
Gender	Male	126	80.8
	Female	30	19.2
Marital Status	Unmarried	2	1.3
	Married	147	94.2
	Widow	7	4.5
Caste & Ethnicity	Chettri	2	1.3
	Janjati	127	81.4
	Dalit	27	17.3
Religion	Hindu	30	19.2
	Buddhists	126	80.8
Language	Nepali	36	23.1
	Thakali	120	76.9
Education level	Primary level	47	30.1
	Lower Secondary level	47	30.1
	Higher Level	23	14.7
	Illiterate	39	25.0
Apple Training	Yes	154	98.7
	Missing system	2	1.3
Tunnel Vegetable Farming Training	Yes	58	37.2
	Missing system	98	62.8
Goat farming Training	Yes	21	13.5
	Missing system	135	86.5
Integrated pest management	Yes	66	42.3
	Missing system	90	57.7
Horticulture training course	Yes	1	.6
	Missing system	155	99.4

Source: *Field Survey, 2021*

Above Table 4 depicts that total number of respondents from Gharapjong R.M is 108 (69.2 percent), where 48 (30.8 percent) respondents from Thasang R.M. All together there were three villages (wards) were taken for the field study. Marpha and Syang from Gharapjong R.M and Tukeche from Thasang R.M. The number of respondents from Marpha was 60 (38.5 percent), 48 (30.8 percent) from Syang and 48 (30.8 percent) from Tukche. Age is very important demographic factor which influences the efficient allocation of resources' it shows the ability to do work, efficiency, willingness to make progress and attitude towards various social and economic aspects of life. The age group of the respondents from field area was categorized into three groups. In age group, up to 40 years old 12.8 percent, 41 to 60 years old were 67.7 percent and more than 61 years old were 29.5 percent. It means two-third of the total population belongs from age group of 41 to 60 years old.

The ratio of male farmer is higher than the female farmer. The main reason behind might be male were more active in farming where female were busy with household chores. Out of 156 farmer respondents, 80.8 percent were male and 19.2 percent (less than one-fifth) were female. About the marital status of the respondents, 94.2 percent (147) were married, 4.5 percent were widow and 1.3 percent were unmarried. Mustang district is dominated by Janjati people, even in the study also, more than 80 percent farmers come from Janjati, where as Dalit were 17.3 percent and very small farmers (1.3 percent) were Chettri. Majority of the household follow Buddhism in the study area. On average, very large majority (80.8 percent) of the household was Buddhists and minorities (19.2 percent) of the household were Hindu. Being Jnajati dominated district, people from here speak their own mother tongue language. The mother tongue language of the respondents' wereThakali and Nepali. Majority (76.9 percent) of the respondents were speaking Thakali language and below one-third (23.1 percent) respondents were speaking Nepali as their mother tongue language.

Education is very important to individual life. The education system of the country is flourished in last decade. But the majority of the respondents are above of 40 years, so the number of highly educated farmers is minimal from the study area. The education level among the farmers was 30.1 percent for both primary and lower secondary level. The higher level education status 14.7 percent and illiterate status was 20.0 percent. There are different training course opportunities for the respondent farmers in the research area. Such trainings were organized and operated by governmental and non-governmental body. There was 98.7 percent farmers were benefitted from Apple farming training. 37.2 percent, 13.5 percent, 42.3 percent were Tunnel vegetable farming training, goat farming training, and integrated pest management training respectively.

Family System and Family Size: Society is formed through the combination of fundamental groups consisting of one or two parents and their children. There are two types of family system in the society and the family size determined by that system.

Table 5: *Family System and Family Size Cross tabulation*

Variables		Family size of the family				Total
		1-4 members	5-7 members	more than 8 members	missing	
Family System	Joint family	0	78	30	1	109 (69.9 percent)
	Nuclear family	18	28	1	0	47 (30.1 percent)
Total		18	106	31	1	156

The family system from the study area is joint family and nuclear family. The Table 5 shows that out of total, 69.9 percent respondent belongs from joint family system and 30.1 percent respondent comes from nuclear family system. Whereas, the family size is categorized into 3 groups viz. 1-4 members, 2-7 members and more than 8 members. 18 of the household from nuclear family system have 1-4 family size, 106 household (78 joint family and 28 nuclear family) have 2-7 members, and 31 household (30 joint family and 1 nuclear family) have more than 8 members in the family. The table shows that majority households were from joint family system and have family size 5-7 members

Number of children going school and colleges: Education is most important in the twenty first century; it enhances light to one's life. Understanding the importance of education, parents are sending their children in different types of colleges and school. The table below shows the number of children going in different schools and colleges.

Table 6: *Children Studying in Different types of School/College*

Variables	Number	Percent
Children going Public School	109	29.86
Children going Private School	69	18.90
Children going Public College/University	58	15.90
Children going Private College	129	35.34
Total	365	100

The Table 6 shows the number of children from study area going in different school and colleges. There are all together 365 children pursuing education. The children going public school and public college/university are 29.86 percent and 15.90 percent respectively. Similarly, the children going private school and colleges are 18.90 percent and 35.34 percent respectively. It shows that more than one-third of the children from the study area attend in private college.

Figure 2: Children studying in Types of School and Colleges

Number

■ Number

Category	Number
Children going Private College	129.00
Children going Public College/Universities	58.00
Children going Private School	69.00
Children going Public School	109.00
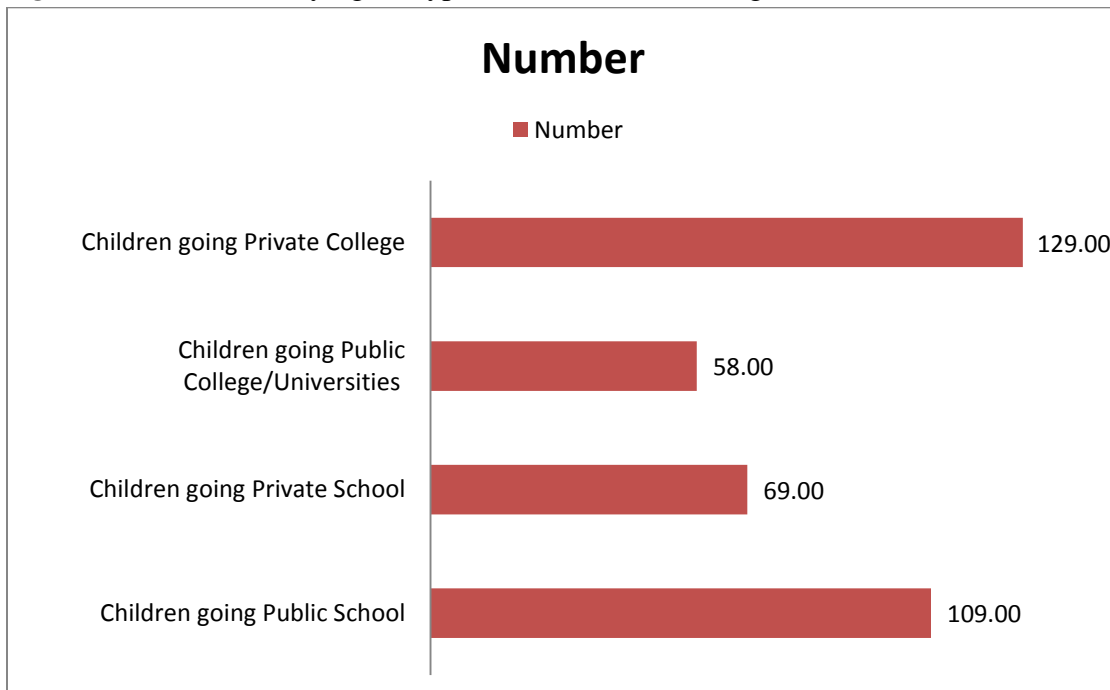
Source: *Field Survey, 2021*

Table 7: *Village and Age of the Respondent Cross tabulation*

Count		Age of the respondent			Total
		Up to 40 years	41 to 60 years	More than 61 years	
village	Marpha	6	29	25	60
	Tukche	10	28	10	48
	Syang	4	33	11	48
Total		20	90	46	156

Source: *Field Survey, 2021*

The Table 7 shows the number of respondents into three age groups (up to 40 years, 41 to 60 years, and more than 61 years old) in the three villages. The highest number of respondent (farmers) belong to 41 to 60 years old in the villages so named: Marpha, Tukche and Syang with number 29, 28 and,33 respectively. The numbers of the respondent more than 61 years are 25 to Marpha, 10 to Tukche and 11 to Syang. The number of farmers up to 40 years are 6,10 and 4 in Marpha, Tukche and Syang respectively.

Table 8: *Village and Education Level Cross Tabulation*

Count		Education Level				Total
		Primary level	Lower Secondary level	Higher Level	Illiterate	
Village	Marpha	15	17	13	15	60
	Tukche	12	18	7	11	48
	Syang	20	12	3	13	48
Total		47	47	23	39	156

The Table 8 compares the education level status of the respondents from the study area. The total number of the illiterate respondents and the number of primary level respondents are 39 and 47 respectively. Whereas, the number of lower secondary and higher level farmers are 47 and 23 respectively.

Land holding status/Land own patterns: Land is evitable either for home or agriculture purposes. Land types and ownership on land plays a vital role to the farmers for their effective production. The tables below show the information about land holding status and land holding patterns by the farmers

Table 9: *Land holding Pattern of the Respondents*

Category	Response	Frequency	Percent
Owned land	Yes	146	93.6
	Missing system	10	6.4
Leasehold land	Yes	44	28.2
	Missing system	112	71.8
Share cropping	Yes	31	19.9
	Missing system	125	80.1
Tenure Access in common Property	Yes	1	.6
	Missing system	155	99.4
Total		156	100

The Table 9 describes the land holding patterns of farmers in the researched area. The status of the farmers with their owned land was 93.6 percent (146), with leasehold land is 28.2 percent (44), with share cropping 19.9percent (31) and 99.4 percent did not have status of tenure access in common property for apple farming and other agricultural purpose.

Table 10: *Descriptive Statistics on Land Holding*

Variables	N	Min	Max	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	SE
Khet	153	1	100	11.59	11.478	4.250	.196
Bhari	96	1	15	2.08	1.728	4.753	.246
Leased land	27	1	10	3.52	2.327	1.627	.448

The Table 10 describes the land holding status of farmer. Out of 156 farmers, 153 farmers have Khet with an average of land 11.59 ropani, with SD 11.478, skewness 4.250 and SE 0.196. 96 farmers have Bhari with an average of land 2.08 ropani, with SD 1.728, skewness 4.753 and SE 0.246. Similarly, 27 farmers had land on leased with an average 3.52 ropani, with SD 2.327, skewness 1.627 and standard SE 0.448.

Domestic animals: Rearing domestic animals comes along with agriculture. Since many generations, people are rearing domestic animals for food dietary, manure, transport, wool, selling and many other purposes. The farmers are also rearing domestic animals in the study area.

Table 11: *Rearing Domestic Animals*

Counts	N	Min	Max	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	SE
Horses/mules as domestic animals	46	1	5	1.43	.779	2.586	.350
Cow/Yak as domestic animal	111	1	5	2.05	.948	1.019	.229
poultry as domestic animal	14	10	40	22.07	8.462	.227	.597
Sheep/goat as domestic animals	35	4	50	19.46	11.561	.948	.398

Source: *Field Survey, 2021*

The Table 11 describes the domestic animals status owned by farmers. In the study area, we found that very minimal number of farmers own domestic animals. The average of poultry (hen & chicken) is 22.07 and of sheep/goat is 19.46, whereas, 2.05 for cow/yak and 1.43 for horse and mules respectively. The reason behind on declination of domestic animals holding status from farmers might be motorable road access and shifting from animal rearing business to service (hotels, lodges, restaurants) sector.

Food sufficiency: Food sufficiency is the one of the priniple of food security which is defined as "*Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"* (WFS, 1996).

Table 12: *Family Food Sufficiency of the Respondents*

Counts		Frequency	Percent
	6 months	64	41.0
	6-9 months	76	48.7
Valid	9-12 months	13	8.3
	>12 months	3	1.9
	Total	156	100.0

Source: *Field Survey, 2021*

The Table 12 explained about the food sufficiency status of family from their own production. Being Himalaya district, limited fertile land, limited types of fruits and crops grown, and its cold climate most of the season, the production rate is very low in compare

to the other districts from Hill and Terai. The above table shows that 41.0 percent (64) farmers have food sufficiency for six months, similarly, 48.7 percent (76) farmers have food sufficiency for 6-9 months, and 8.3 percent (13) household have food sufficiency for 9-12 months and only 1.9 percent (3) household have food sufficiency for more than 12 months. The table concluded that majority of food consumed in the study area are imported.

4.2 Private Returns analysis: Economic and Non-Economic

The first objective of my research paper is to assess economic and non-economic private returns of apple farming during COVID-19 periods. In this section, the researcher has assessed the both economic and non-economic private returns.

Different sources of occupation: People own different types of occupation to sustain and run their daily livelihood. For the betterment and improvement of their life and their family life, to meet the basic daily needs, household respondents from the researched area also adopt different types of occupation.

Table 13: *Sources of Family Income*

Category	Response	Frequency	Percent
Agriculture	Yes	156	99.4
	Missing system	1	.6
Entrepreneur	Yes	5	3.2
	Missing system	151	96.8
Business	Yes	73	46.8
	Missing system	83	53.2
Public Service	Yes	12	7.7
	Missing system	144	92.3
Private job	Yes	22	14.1
	Missing system	134	85.9
Remittance	Yes	54	34.6
	Missing system	102	65.4
Total		156	100.0

Source: *Field Survey, 2021*

In the study area, the family adopts different types of occupation to run their livelihood. The Table 13 explained status about different types occupation adopts by the farmer household. The table indicates that all 156 (99.4 percent) run agriculture as source for the family occupation. Likewise, 46.8 percent, 34.6 percent, 14.1 percent and 7.7 percent farmers run business, remittance, private job and government job as source for family occupation respectively.

Income source: There are different sources for respondent to make income. In the study area, respondent HHs was making income from different source. The table below shows the information about the income made by respondent HHs from different source.

Table 14: *Descriptive Statistics on Family Income*

	N	Min	Max	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	SE
Agriculture	156	20000	6300000	678076.92	717457.982	3.845	.194
Business	75	30000	2000000	457733.33	332515.284	2.509	.277
Govt. job	12	50000	600000	369166.67	139117.892	-.891	.637
Private job	19	150000	600000	265789.47	100073.073	2.254	.524
Enterprises	4	300000	1500000	825000.00	537742.193	.574	1.014
Remittance	56	300000	7000000	722321.43	1230333.275	4.995	.319

Source: *Field Survey, 2021*

The Table 14 describes the different types of source for family income of household respondents. The total number of 156 respondents was involving in apple farming; the mean income from agriculture is Rs. 678076.92 with standard deviation 717457.982, positively skewed 3.845 and standard error 0.194. Likewise, 75 household were involved in business specially hotels, lodge and restaurants with average income Rs. 457733.33, SD 332515.284, positively skewed 2.509 and SE 0.277. Thirdly, remittance comes with 56 household as source of income with average income Rs 722321.43, SD 1230333.275, with positively skewed 4.995 and SE 0.319. The total number of 19 household respondents was involved in private job with average income Rs. 265789.47, with SD 100073.073, positively skewed 2.254 and SE 0.524. 12 respondent's family members were in public service with average income Rs. 369166.67, SD 139117.892, negatively skewed -0.891 and SE 0.637. Least respondents with value 4 engaged in entrepreneur an average income Rs. 825000.00, skewed 0.574, standard error 1.014.

Expenses: Expenses on different items must be made to meet and fulfill the basic needs and requirements. The family members of the respondents made expenses on different items throughout the years. The table shows the around average expenses made by the respondent household in different items.

Table 15: *Descriptive Statistics on Family Expenses*

Variables	N	Min	Max	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	SE
Food	156	40000	2500000	202243.59	268684.546	5.955	.194
Clothes	155	5000	750000	43987.10	61245.195	10.123	.195
Children Education	154	10000	2000000	139967.53	203690.218	7.090	.195
Travelling/pilgrimage	108	10000	200000	49694.44	31093.606	1.993	.233
Cultural celebration	156	5000	1000000	49929.49	82210.988	10.229	.194
Health/medicine	139	1000	750000	58741.01	77852.363	5.559	.206
Philanthropy	153	4	150000	13660.18	15737.173	5.345	.196

Source: *Field Survey, 2021*

The Table 15 explains about the total expenses made by household respondents in different purpose. The average expenses on a food are RS. 202243.59, SD 268684.546, skewness 5.955 and SE 0. 194. Similarly, the average expenses on the clothes of

household are Rs. 43987.10, with SD 61245.195, skewness 10.123 and SE 0.195. Likewise, the average expenses made on children education is Rs. 139967.53, SD 203690.218, positively skewed 7.090 and SE 0.195. In addition to that, the average expenses of family on travelling/pilgrimage are 49694.44, with SD 31093.606, skewness 1.993 and SE 0.233. The other purpose of expenses by family member is cultural celebration with average expenses of Rs. 49929.49, with SD 82210.988, positively skewed 10.229 and SE 0 .194. The second last purpose of expenses of family members is Health/medicine with average expenses of Rs. 58741.01, with SD 77852.363, skewness 5.559 and SE 0.206. The last one is expenses on philanthropy purpose with an average expenses of Rs.13660.18, with SD 15737.173, skewness 5.345 and SE 0.196.

Types of farm and major crops on farmland: The respondent HHs own different types of farmland for different purposes and they grew different types of major crops on their arable land. The tables below show the types of farmland own by the farmers and major crops they grew.

Table 16: *Types of Farm on Land*

Category	Response	Frequency	Percent
Crop farm	Yes	133	85.3
	Missing system	23	14.7
Orchard farm	Yes	154	98.7
	Missing system	2	1.3
Grass farm	Yes	10	6.4
	Missing system	146	93.6
Vegetables farming	Yes	63	40.4
	Missing system	93	59.6
Total		156	100.0

Source: *Field Survey, 2021*

The Table 16 depicts the major types of crops grown in the farmer farmland through the year. Out of total, 85.3 percent (133) farmers farmed different types of crops, 98.7 percent (154) farmers grow different types of orchard farm like apples, walnuts, apricots. Whereas most of the cattle are grazing freely on the hills, so number of farmer doing commercial grass farming is least. Only 6.4 percent (10) farmers have grass farming for their cattle and 40.4 percent   (63) farmers doing different types of seasonal vegetables farming.

Table 17: *Different Crops as Major Crops in Farmland*

Category	Response	Frequency	Percent
Buckwheat	Yes	102	65.4
	Missing system	54	34.6
Wheat	Yes	83	53.2
	Missing system	73	46.8
Potato	Yes	131	84.0
	Missing system	25	16.0
Beans	Yes	87	55.8
	Missing system	69	44.2
Total		156	100.0

Source: *Field Survey, 2021*

The Table 17 highlights the different types of major crops produced by farmers. The major crops produced in the districts are beans, potato, wheat and buckwheat. 65.4 percent (102), 53.2 percent (83), 84.0 percent (131) and 55.8 percent (87) farmers grow buckwheat, wheat, potato and beans respectively. Farmers were involved in commercial farming in different interval of time, so their involvement period will be different.

Table 18: *Farm Involvement Years*

	Time	Frequency	Percent	Mean (Years)
Valid	Below 10 years	4	2.6	
	11-20 years	87	55.8	
	21-30 years	46	29.5	22.11
	More than 31 years	19	12.2	
	Total	156	100.0	

Source: *Field Survey, 2021*

The Table 18 shows that more than half (55.8 percent) farmers have been involved in commercial farming for 11-20 years, and 29.5 percent for 21-30 years. Likewise, 12.2 percent of total have been involved in commercial farming for more than 31 years and least 2.6 percent for below 10 years. The average year of involvement in commercial farming of total is 22.11 years. Each individual farmer has different recurring cost for different purpose.

Table 19: *Descriptive Statistics on Recurring Cost*

Category	N	Min	Max	Mean	SD
	Statistic	Statistic	Statistic	Statistic	Statistic
Recurring cost for buying land	99	1	1	1.00	.000
Recurring cost for leased land	36	1	1	1.00	.000
Recurring cost for accommodation/house	96	1	1	1.00	.000
Valid N (listwise)	0				
Initial investment while starting commercial farm	156	20000	2000000	228942.31	234514.605

Source: *Field Survey, 2021*

The Table 19 illustrates, 99, 36, 96 number of farmers have recurring cost for buying land, leased land and for accommodation/house. Similarly, the average initial investment while starting commercial farming is Rs. 228942.31, SD 234514.605.

Yearly expenses on different items to apple farming: Commercial apple needs investment on different items. For farming, farmers must to make investment on different items throughout year. The table below shows the mathematical information of yearly expenses made on different items.

Table 20: *Descriptive Statistics on Farm Expenses*

Counts	N	Min	Max	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	SE
Yearly expenses for new seeds	115	5000	500000	43478.26	76382.561	3.913	.226
Yearly expenses for fertilizers/pesticide/Vitamin	156	15000	900000	133807.69	163527.254	2.556	.194
Yearly expenses for Irrigation purpose	117	1000	53000	7294.87	8304.090	3.017	.224
Yearly expenses for Transportation	2	30000	30000	30000.00	.000	.	.
Yearly expenses for labour	156	5000	600000	90445.51	120923.471	2.394	.194
Yearly expenses for experties visit on farm	147	2000	65000	7953.06	9811.548	3.707	.200

Source: *Field Survey, 2021*

The Table 20 describes about the different yearly expenses made for apple farming. The average expenses for a new seeds are Rs. 43478.26, with SD 76382.561, skewness 3.913 and SE 0.266. The highest average expenses were on fertilizers/pesticides/vitamin worth of Rs. 133807.69, with SD 163527.254, skewness 2.556 and SE 0.194. The second highest yearly expenses for labour with worth average value Rs. 90445.51, SD 120923.471, skewness 2.394 and SE 0.194. The average expenses made for irrigation and expertise visit were Rs. 7294.87 and Rs.7953.06. The average expenses for transportation were negligible because retailers or wholesaler managed the transport facilities while harvesting apple from farm.

PMAMP financial and technical help: Prime Minister Agriculture Modernization Project (PMAMP) is the largest existing project under the Ministry of Agriculture and Livestock Development. Mustang district was introduced as Apple zone in 2075 B.S.

Table 21: *PMAMP Financial and Technical Assistance*

Response		Frequency	Percent
Valid	yes	127	81.4
	Not yet	29	18.6
	Total	156	100.0

Source: *Field Survey, 2021*

PMAMP (Prime minister Agriculture Modernisation Project) is a project introduced in 2072 B.S with a clear and specific road map for increasing agriculture

production and productivity to make the country self reliant in agriculture production and live stock within a decade. This project assisting farmers through technical, financial assists, training. The Table 21 shows the status of the farmer receiving technical and financial assists from PAMP. It is clearly seen that 81.4 percent (127 numbers) of farmers have received different kinds of assistance from PAMP, whereas, 18.6 percent (29 numbers) of farmers have not received yet any forms of assist from PAMP.

Investment sources and Capital debt: Investment should be made while installing and operating apple farming. The farmers from the researched area have also different source of investment. As while running business, the farmers took loan from different institutions. The investment sources and capital debt of the farmers in different institutions are highlighted in the table below.

Table 22: Different Investment Sources.

Category	Response	Frequency	Percent
Owned saving	Yes	155	99.4
	Missing system	1	.6
Relative loan	Yes	73	46.8
	Missing system	83	53.2
Bank loan	Yes	41	26.3
	Missing system	115	73.7
Cooperative loan	Yes	20	12.8
	Missing system	136	87.2
Total		156	100.0

Source: *Field Survey, 2021*

Investment fund is most necessary for starting any kind of business. While starting apple farming, farmers managed cash fund through different medium. The Table 22 described the status of different sources for investment of apple farming. The major source for investment was owned saving where 99.4 percent (155 numbers) of farmers used their own saving money for investment. Secondly, 46.8 percent (73 numbers) of farmers used relative loan for investment. Similarly, 26.3 percent and 12.8 percent of farmers used bank loan and cooperative loan for investment respectively.

Table 23: *Descriptive Statistics on Capital debt in Different Institutions*

Variables	N	Min	Max	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	SE
Capital debt for Cooperative	19	150000	1350000	421052.63	282506.534	2.229	.524
Capita debt for Bank	35	120000	1800000	616285.71	382084.728	1.112	.398
Capital debt for Relatives	16	100000	700000	374375.00	188431.022	.202	.564

Source: *Field Survey, 2021*

The Table 23 described the capital debt from different source owned by the farmers. The average capital debt for cooperative is Rs. 421052.63, SD 282506.534,

skewness 2.229 and SE 0.524. Similarly, the average capital debt for bank is Rs. 616285.71, SD 382084.728, skewness 1.112 and SE 0.398. Likewise, the average capital debts for relatives are 374375.00, SD 188431.022, skewness 0.242 and SE 0.564.

Technical assistance and financial assistance from Non/governmental organization:

To improve the productivity, skills, knowledge, livelihood of the farmers, there is provision and opportunity of providing technical and financial assistance by Non/governmental organizations to the farmers. The tables below show different technical and financial assistance received by the farmers from Non/governmental organizations.

Table 24: *Technical Assistance from Non/governmental Organization*

Category	Response	Frequency	Percent
Training opportunity	Yes	143	91.7
	Missing system	13	8.3
Tour opportunity	Yes	107	68.6
	Missing system	49	31.4
Rewards opportunity	Yes	20	12.8
	Missing system	136	87.2
Agricultural tools	Yes	57	36.5
	Missing system	99	63.5
All of above	Yes	3	1.9
	Missing system	153	98.1
Total		156	100.0

Source: *Field Survey, 2021*

The Table 24 described about different types of technical assistance obtained from Non/governmental organization by the farmers. 91.7 percent of farmers received training opportunity from such organization in different intervals, whereas 68.6 percent, 36.5 percent and 12.8 percent of farmers are facilitated with tour opportunity, agricultural tools, and rewards opportunity respectively.

Table 25: *Financial Assistance from Non/governmental Organization*

Category	Response	Frequency	
Subsidy	Yes	111	71.2
	Missing system	45	28.8
Low interest loan	Yes	61	39.1
	Missing system	95	60.9
Daily allowance	Yes	3	1.9
	Missing system	153	98.1
Cash prize	Yes	30	19.2
	Missing system	126	80.8
Total		126	100.0

Source: *Field Survey, 2021*

The Table 25 shows the statistic information about financial assistance from Non/governmental organizations obtained by the farmers from the researched area. 71.2 percent of farmers are privileged with subsidy, whereas 39.1 percent and 19.2 percent farmers received low interest loan and cash prize respectively. Only 1.9 percent of

farmers obtained daily allowance which proved that such organization does not facilitate farmers for allowance facility.

Access to nutritional food and fruits, family quality life improvement: Accessibility to nutritional food and fruits by individual at any time is a one pillar of food security. The table below tends to highlight whether the apple farming support on family member accessibility to nutritional food and fruits and their quality life improved.

Table 26: *Access to Nutritional Food and Improving Quality of Life*

Variable	Response	Frequency	Percent
Family members access to nutritional food and fruits	Strongly agree	32	20.5
	Agree	95	60.9
	neutral	10	6.4
	Disagree	19	12.2
Family quality life improvement	Strongly agree	61	39.1
	Agree	64	41.0
	neutral	13	8.3
	Disagree	18	11.5
Total		156	100.0

Source: *Field Survey, 2021*

The Table 26 shows the degree of agree to the family members access to nutritional food and fruits and family quality life improvement. The table highlighted that 60.9 percent of farmers agreed that their family members have good access to nutritional food and fruits whereas 20.5 percent of farmers strongly agreed that family members have access to nutritional food and fruits. Similarly 12.2 percent and 6.4 percent of farmers disagreed and stay neutral that family members access to nutritional food and fruits respectively. The second table highlighted that 39.1percent , 41.0percent , 8.3percent and 11.5 of farmers strongly agreed, agreed stayed neutral and disagreed that their family quality life improvement from apple farming respectively.

Improving living standard: Apple farming helps in generating income to the farmers. Farmers earn revenue by selling their delicious apple, apple juice, apple brandy, dry apple. Mustang apples are getting sound price than rest of the other district apples. Livelihood of the farmers depends upon it.

Table 27: *Apple Farming Improving Living Standard of the Farmers*

Count		Frequency	Percent
Valid	Strongly agreed	89	57.1
	Agreed	57	36.5
	Don't know	6	3.8
	Disagreed	3	1.9
	Strongly disagreed	1	.6
	Total	156	100.0

Source: *Field Survey, 2021*

The Table 27 shows that 57.1 percent and 36.5 percent respondents are strongly agreed and agreed with the statement that apple farming supported on improving living standard

of the locale, whereas, 1.9 percent and 0.6 percent strongly disagreed and disagreed with the purposed statement. During the KII one of the farmers expressed that;

> *Apple farming supports my family livelihood; we managed half of yearly household expenses by selling an apple from our farm* (S. BK, Tuesday, 14th Sep, 2021).

4.3 Social Return Analysis: Economic and Non-Economic

The second objective of the research paper is to assess economic and non-economic social returns of apple farming during COVID-19 periods. In this section, the researcher has analyzed the economic and non-economic social returns of the respondent during COVID-19.

Labour involvement: In apple farming, the workforce is a core for the growth and well-functioning of the farming. Labour operates different manual works in the apple farm. The table below shows the number of labour within from family and temporarily labour.

Table 28: *Descriptive Statistics on Labour Involvement*

Counts	N	Min	Max	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	SE
Male member from family involve in farming	154	1	3	1.45	.524	.486	.195
Female member from family involve in farming	156	1	3	1.51	.596	.693	.194
Male Labor worked in farm temporarily	151	1	12	2.52	1.599	2.065	.197
Female labor worked in farm temporarily	154	1	8	2.33	1.517	1.847	.195
Valid N (listwise)	147						

Source: *Field Survey, 2021*

The Table 28 highlights the statistics of the labour involved in the apple farm. The mean of male and female family members involve in apple farming are 1.45, and 1.51, with SD 0.524, and 0.596, skewness 0.486, and 0.693 and SE 0.195 and0.194 respectively. The average of the male and female labor worked in farm temporarily is 2.52 and 2.33, SD 1.599, and 1.517, skewness 2.065, and 1.847, SE 0,197, and 0.195 respectively. During the KII one of the wage labour working in farm house expressed that;

> *We came all the way from Rolpa district to work here, we worked here in the apple farm, but the wages paid to us is low. The foods are expensive to buy. So we wish rise in our daily wages so that we can meet our daily necessities* (S. Magar, 14th Sep, 2021). In the same line another participant expressed that;
>
> *It is sad to see the youth and teenage are not willing to work in the farm, we have to hire labor which rise the production cost and in future, may be, we have to give in lease because our children are not interested to engage in apple farming* (B. L. Thakali, 17th Sep, 2021).

Compost fertilizers: Fertilizers provide nutrients to the plant. It helps in growth of plant and fruits. Due to the concept of organic food, and health awareness, ones prefer to consume food and fruits free from chemical fertilizers. Therefore, farmers are also preparing compost fertilizers for their crops, vegetables and fruit plants. The table below shows the status of prepare and sell of compost fertilizers.

Table 29: *Compost Fertilizers Preparation and Sell*

Category	Response	Frequency	Percent
Do you prepare compost fertilizers for your farm?	Yes	148	94.9
	Not yet	7	4.5
	Planning	1	.6
Do you sell compost fertilizers?	Yes	46	29.5
	not yet	95	60.9
	Planning	15	9.6
Total		156	100.0

Source: *Field Survey, 2021*

The Table 29 shows that 94.9 percent of the farmers prepared compost fertilizers for their farm and 29.5 percent of the farmers sell their compost fertilizers for others. 4.5 percent of the farmers do not prepare fertilizers yet and 60.9 percent of the farmers do not sell their prepared fertilizers yet where as 9.6 percent of the farmers planning to sell their fertilizers.

Visitors status: For different purpose (study, researched, intern, data collection), different types of visitors visited the apple farm. The table below shows the number of visitors in the farm.

Table 30: *Descriptive Statistics on Farm Visitors*

Statistics	N	Min	Max	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	SE
Number of students visited in farm	100	10	2400	127.05	267.101	6.588	.241
Number of farmers visited in farm	137	10	700	105.51	114.842	2.517	.207
Number of researchers visited in farm	106	1	50	7.98	8.258	2.742	.235
Number of officers visited in farm	126	2	60	16.90	11.807	2.011	.216
Valid N (listwise)	79						

Source: *Field Survey, 2021*

The Table 30 shows the statistical information regarding the status of visitors in the farmland. The majority visitors are students and the farmers. The average number of the students and the farmers visited in the farm are 127.05 and 105.51, with SD 267.101 and 114.842, with skewness 6.588 and 2.517, and SE 0.241 and 0.207. The average

number of researcher and the officers in the farm are 7.98, and 16.90, with SD 8.258 and 11.807 respectively.

Participation in community Institution: Since for many generations, there exists a community institution to function community smoothly and effectively. It's an individual responsibility to be part of such institution. The table below shows the status of farmer linked with different community institution.

Table 31: *Farmers' Involvement in Community Institutions*

Category	Response	Frequency	Percent
Participate in farmer group	Yes	150	96.2
	Missing system	6	3.8
Participate in cooperative group	Yes	67	42.9
	Missing system	89	57.1
Participate in school management community	Yes	41	26.3
	Missing system	115	73.7
Participate in youth club	Yes	42	26.9
	Missing system	114	73.1
Total		156	100.0

Source: *Field Survey, 2021*

The Table 31 depicts the information regarding participation of farmers in different existed community institution. It shows that 96.2 percent of the farmers were participate in farmer group, whereas, 42.9 percent were participated in cooperative group, likewise, 26.3 percent participated in school management community and 26.9 percent participated in youth club.

Increment of Technology used: Technology makes the work easier. Technology used in apple farming also lead to the much better production, cost effectiveness, time save. Therefore, modern agricultural technologies are inevitable for the apple farming.

Table 32: *Technology using in Farming*

		Frequency	Percent
	Strongly agreed	17	10.9
	Agreed	114	73.1
Valid	Don't know	23	14.7
	Disagreed	2	1.3
	Total	156	100.0

Source: *Field Survey, 2021*

The Table 32 shows the strong idea that more than 80 percent (84 percent) farmers either agreed or strongly agreed with the statement that there has been increased in technology used in commercial apple farming in the district. Whereas, 14.7 percent farmer don't know the increasing trend of technology used and 1.3 percent farmers are disagreed with the statement. During the KII one of the farmers expressed that;

As the trend of planting hybrid Fuji apple tree in the district increase, it's a great threat to local apple tree. Farmer planted new hybrid because it gives yields in short time and easy to take care (M. Thakali, Farmer, 15th Sep, 2021).

Mutual relationship: After living in the society, the people have different bonding with each other. The strong the relationship, the better the result it leads to. The better mutual relationship among the farmers leads to the unity, function society smoothly.

Table 33: *Mutual Relationship among the Farmers*

Counts		Frequency	Percent
Valid	Strongly agreed	16	10.3
	Agreed	81	51.9
	Don't know	44	28.2
	Disagreed	15	9.6
	Total	156	100.0

Source: *Field Survey, 2021*

The Table 33 shows the relation status among the farmers. The farmers are living there with good and mutual harmony which is proved from the table description. More than 60 percent either agreed or strongly agreed with the statement that there is mutual relationship among the farmers. Whereas, 28.2 percent farmers don't know and 9.6 percent of total respondents disagreed with the statement. This indicates that due to the mutual relationships the agro tourism development activities is increasing in the study area. During the KII one of the farmers expressed that;

Majority of the people financial status rising through apple farming and tourism business. But sad part is more than one-third of the youth are in overseas for different purpose (M. Gurung, 17th Sep, 2021). In the same line, one of the tourism entrepreneurs expressed that;

Mustang is beautiful for its natural assets and cultural enrich. After the link with road transportation, number of domestic tourists in the district boomed rapidly. Tourists enjoyed visiting apple and buying apple, dry apple, Marpha brandy from the farm gate and the shop. We believe, an apple farming also support on promoting tourism (R. Lalchan, 16th Sep, 2021).

Promotion of local identity: Mustang is famous for its natural beauty, unique geographical topography, culture enrich and apple farming. Apple farming adds more beauty of the district. Certain percent of total visitors came Mustang for exploring and observing the district Apple farming, which prove that apple farming help in promoting of district identity to outsiders.

Table 34: *Farming Promotes Local Identity*

Counts		Frequency	Percent
Valid	Strongly agreed	64	41.0
	Agreed	81	51.9
	Don't know	9	5.8
	Strongly disagreed	2	1.3
	Total	156	100.0

Source: *Field Survey, 2021*

43

The Table 34 shows that more 41.0 percent and 51.9 percent respondents believed that apple farming support on promoting local identity to the national and international level. Similarly, 5.8 percent and 1.3 percent disagreed with the statement. During the KII one of the Retailer expressed that;

The Indian and Chinese imported apples are threat to the Mustang apple. Though, Nepali consumer preferred our Mustangi apple for its color and taste (S. Lama, 15th Sep, 2021). In the same line, another farmer expressed that; *the taste and crispiness of an apple from the district decline because of early picking rather than its actual time to harvest* (K. B. Lalchan, Sunday, 12th Sep, 2021).

Expansion planning: If any kind of business firm or products gives fruitful profit, one tends to increase its volume. The table below shows the expansion plan of apple farm by the farmers.

Table 35: *Farm Extension Plan*

Count		Frequency	Percent
Valid	yes	59	37.8
	not yet	79	50.6
	may be in future	18	11.5
	Total	156	100.0

Source: *Field Survey, 2021*

The Table 35 shows the status of expansion plan of apple farming by the farmers. It clearly shows that 37.8 percent have expansion plan, 50.6 percent do not have expansion plan yet and 11.5 percent of the farmers have a may be in future plan for expansion. During the KII one of the farmers expressed that;

The apple farm land has been increased in last five years, the farmers started to cultivate in barren land that was not agriculture earlier (R. B. BK, Sunday, 12th Sep, 2021).

Difficulties in apple farming: The opportunities and difficulties come simultaneously in any field. In apple farming, there are many difficulties, challenges, hurdles, constraint, limited opportunities, should be faced by the farmers.

Table 36: *Difficulties in Farming*

Categories	Response	Frequency	Percent
Shortage of manpower	Strongly agreed	1	.6
	Agreed	84	53.8
	Neutral	10	6.4
	Disagreed	61	39.1
Shortage of Storage	Strongly agreed	132	84.6
	Agreed	24	15.4
Insects & diseases problems	Strongly agreed	59	37.8
	Agreed	94	60.3
	Disagreed	1	.6
	Strongly disagreed	2	1.3
Shortages of pesticides, vitamins and fertilizers	Strongly agreed	8	5.1
	Agreed	85	54.5
	Neutral	24	15.4

	Disagreed	38	24.4
	Strongly disagreed	1	.6
Poor Technical Knowledge	Strongly Agreed	11	7.1
	Agreed	80	51.3
	Neutral	31	19.9
	Disagreed	34	21.8
Climate change impact	Strongly agreed	119	76.3
	Agreed	35	22.4
	Neutral	1	.6
	Strongly disagreed	1	.6
Poor infrastructure	Agreed	88	56.4
	Neutral	27	17.3
	Disagreed	40	25.6
	Strongly disagreed	1	.6
Total		156	100.0

Source: *Field Survey, 2021*

The Table 36 highlights that around 54.0 percent agree with the shortage of manpower in apple farm, whereas 6.4 percent remain neutral and 39.1 percent disagreed with the statement of shortage of manpower. The small farmers usually worked by themselves in the farm, whereas, big commercial farmers hired labour from neighboring districts. Likewise, there is no any modern technology facilitated storage house in the district. The products from the district either go to the market after harvesting or store through traditional ways. It shows that all 156 (100 percent) respondents either agreed or strongly agreed with the statement of shortage of storage. Similarly, Mustang apple also affected by different types of insects and diseases problems. Insects like tent caterpillar, shoot borer, leafhoppers, apple maggot and diseases like powdery mildew, apple scab, foot and root diseases, cedar-apple rust. It shows that nearly 100.0 percent of the respondents agreed and had dealt with insects in their farm. During the KII one of the Technical experts expressed that;

> *Different kind of new diseases and insects are seen in the farm and the plant are dying because of diseases and insects which leads to the increment in planting cost* (P. Tulachan, Monday 13th Sep, 2021).

Likewise, 54.5 percent and 5.1 percent farmers agreed and strongly agreed with the statement of shortage of pesticides, vitamins and fertilizers. Meanwhile, 15.4 percent remain neutral, about 25.0 percent. Nearly 60.0 percent farmers are either strongly agreed or agreed with poor technical knowledge of apple farming. Whereas, 19.9 percent remain neutral and 21.8 percent disagreed with the statement. Mustang is one of the high Himalaya districts, where the overall part of the districts faces many challenges from global warming and climate change. Temperature increment, irregular snowfall, drought, dry air, irregular rainfall etc. are the problems faced by locale. Even the table shows that almost 100.0 percent (156) respondents agreed with the statement of climate change impacts to the apple farmers. During the KII one of the farmers expressed that;

> *If temperature increased continuously, then we have to swift our farming to the high altitude where soils are not fertile and irrigation problem prevail. Global*

warming results threat to the farming and in future apple farming might extinct in lower part of the district (C. BK, 17th Sep, 2021)

Likewise, nearly 60.0 percent farmers are either strongly agreed or agreed with poor technical knowledge of apple farming. Whereas, 19.9 percent remain neutral and 21.8 percent disagreed with the statement. Even the Mustang is connected to outsider by road and air. Still, the infrastructure related to agriculture is not that much better. The table shows that 56.4 percent, 17.3 percent, 25.6 percent farmers are agreed, remain neutral, and, disagreed respectively with the poor infrastructure statement. During the KII one of the role model female farmers expressed that;

Road link boom commercial farming in the district and transportation help the farmer to sell their products in reasonable price (R. Lalchan, Monday 13th Sep, 2021). In the same line, one Truck Driver expressed that;

During Sep, each year, the road side of the Myagdi district is damaged by the landslide and flood, so it creates difficult situation on transporting apple to the market and increase the transportation cost (R. Gurung, Monday 13th Sep, 2021).

Table 37: *Farming related Problems Faced during COVID-19*

Probing Questions	Response	Frequency	Percent
Did you face farming related problems during COVID-19?	No	127	81.4
	Missing system	29	18.6
Did you face shortage of labour/manpower?	Yes	22	14.1
	Missing system	134	85.9
Shortage of fertilizers/ pesticides/vitamins	Yes	15	9.6
	Missing system	141	90.4
Shortage of agriculture tools	Yes	12	7.7
	Missing system	144	92.3
Total		156	100.00

Source: *Field Survey, 2021*

The Table 37 shows that 81.4 percent of the total respondents did not face any farming related difficulties and problems during COVID-19 period. Similarly, 14.1 percent farmer faced the shortage of manpower where 85.9 percent farmer did not face that problem, because during lockdown period, the manpower from hotel, lodges and restaurants shift to the agriculture. As on the interviewed, below 10.0 percent faced the problems of shortage of pesticides, fertilizers, vitamins where 90.4 percent farmers did not face. The 7.7 percent farmers faced the shortage of agricultural tools where rest of the farmers did not.

COVID-19 Impact: During COVID-19, the whole world and the country was locked down, where the mobility of people and transportation was difficult. During that period, farmers also faced many problems. Even the farmers from the study area, faced some of the farming related problems during that period.

Table 38: *COVID-19 related Probing Questions to the Farmers*

Questions	Response	Frequency	Percent
Did your production faces market problems during COVID-19?	No	156	100.0
Did your apple get waste during COVID-19?	No	140	87.5
	Missing system	16	12.5
Did your apple price decreased than previous year?	No	156	100.0
Did you receive any financial compensation during COVID-19?	Not receive	156	100.0

Source: *Field Survey, 2021*

The Table 38 explains the answers to different questions asked to the farmers during COVID-19 duration. Regarding market problems, 100 percent farmers did not face any kind of market problems for their farm apple. Similarly, majority farmers 87.5 percent did not have their apple gone waste during COVID-19. The farmers from the district are getting better price each year. During the researched time, 100.0 percent respondents did not face the problems of price decreased than previous year. During COVID-19, different group received some kind of financial aid from the governmental or non governmental body, but the all respondents (100.0 percent) did not received any king of financial compensation during pandemic period. During the KII, officer of Temperate Horticulture Development Center shared that;

> *We are doing our best to tackle the problems faced by the farmers and educating them to fight against diseases and insects prevail in the farm* (P. Aatrey, Tuesday, 14th Sep, 2021).

Potential Market: Market is the most necessary for the farmers to sell their product. Apple produced from the district has potential market in different districts. If there is good market for the products, only then farmers motivated to produce more apples.

Table 39: *Potential Market*

Indicators			Frequency	Percent
Inside district	Yes		76	48.7
	Missing system		80	51.3
Myagdi	Yes		115	73.7
	Missing system		41	26.3
Kaski	Yes		109	69.9
	Missing system		47	30.1
Kathmandu	Yes		57	36.5
	Missing system		99	63.5
Other districts	Yes		32	20.5
	Missing system		124	79.5
Total			156	100.0

Source: *Field Survey, 2021*

The Table 39 shows the information about different markets for the apple produced. The largest markets for the produced apples from district are Myagdi and Kaski with average value of 73.7 percent and 69.9 respectively. Similarly, the farmers are also selling the apples in the farm to the visitors because Mustang is on the most popular

destination for the domestic and international tourists. The average value of 48.7 percent for market is inside the district. In addition, the average value of 36.6 percent and 20.5 percent for market possibility for the Kathmandu and the other district.

Marketing Channels: There are two marketing channels:

Channel A: Producer- consumer & Channel B: Producer-trader-consumer.

Table 40: *Marketing Channels*

Channels	Response	Frequency	Percent
Selling produced apples through channel A	Yes	152	97.4
	Missing system	4	2.6
Selling produced apples through channel B	Yes	147	94.2
	Missing system	9	5.8
Total		156	100.0

Source: *Field Survey, 2021*

The Table 40 shows that there are two channels for selling the produced apples viz. channel A (from farm gate) and channel B (through retailers). The table shows that 97.4 percent of the farmers are selling their apples from the farm gate also. The table shows that 94.2 percent of the farmers sell their apple through channel B (retailer).

Table 41: *Market Channel and Marginal Price*

Market channel, market margin and producer's share of apple farmers in the study area				
Marketing Channels	Farm-gate price (NRs.)	Retail price (NRs.)	Market margin	Producer share
Channel A	119.68	119.68	0.00	100.00percent
Channel B	92.16	162.72	70.56	56.63percent

Source: *Field Survey, 2021*

According to table 41, there are two marketing channels were found in the study area in which channel A was found more profitable than channel B. Considering Channel A, the marketing margin and producer's shares are 0 and 100 percent respectively. Similarly for the channel B (producer – traders – consumer) the marketing margin and producer's share was found 70.56 and 56.63 percent respectively. During the KII one of the retailers expressed that;

> *The apple of the district getting better price than last decade. Retailers are willing to buy an apple from farm gate* (B. P. Garbuja, Sunday, 12th Sep, 2021).

Table 42: *Difference Price of Apple*

Statistics		Farm Gate Price	Retailer Price	Market Price	Remarks
N	Valid	154	147	156	Per KG
	Missing	2	9	0	
Mean		119.68	92.16	162.72	
Minimum		110	85	120	
Maximum		135	99	190	

Source: *Field Survey, 2021*

The Table 42 shows the statistic information about the average price of an apple in different channel. There are all together 154 farmers sell the apple from their farm at the average price of Rs.119.68 per kg. Similarly, 147 farmers sell their apple through retailer at the average price of Rs. 92.16 per kg. But the average market price of apples paid by consumers is Rs. 162.72 per kg. The maximum and minimum prices of apples per kg are Rs. 135 and Rs. 110 at farm gate. The maximum and minimum prices of apples per kg are Rs.99 and Rs. 85while selling through retailers and the maximum and minimum prices of apples per kg are Rs. 190 and Rs. 120.

4.4 Relationship Test

In this section, the researcher has analyzed and calculated some of the reliable relationship test like rank correlation test, normality test, regression analysis test.

4.4.1 Rank Correlation

Table 43: *Involvement (years) in Commercial Farming and Yearly Average Income*

Correlations			Involvement in farming	Annual average income
Spearman's rho	Involvement (years) in commercial apple farming	Correlation Coefficient	1.000	.300[**]
		Sig. (2-tailed)	.	.000
		N	156	156
	yearly average income from apple farming	Correlation Coefficient	.300[**]	1.000
		Sig. (2-tailed)	.000	.
		N	156	156
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: *Field Survey, 2021*

The Table 43 shows that the Speaman's correlation coefficient (r_s) is 0.33 that means there is positive correlation between involvements years and yearly average income from it. The sig value is 0.00<0.05, that means there is a significant correlation between the variables (statistically significant).

Table 44: *Education Level and Total Family Income*

Correlations			Education Level	Total Family Income
Spearman's rho	Education Level	Correlation Coefficient	1.000	.271[**]
		Sig. (2-tailed)	.	.001
		N	156	156
	Total income of family	Correlation Coefficient	.271[**]	1.000
		Sig. (2-tailed)	.001	.
		N	156	156
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: *Field Survey, 2021*

The Table 44 shows the Spearman's correlation coefficient (r_s) 0.271 that means there is weak positive correlation between the variables. As the Sig. (p) value is 0.001<0.05, that means there is significant correlation between the variables or variables are statistically significant. The education level of the respondent associated weakly with the family total income.

Table 45: *Total Family Income and Total Family Expenditure*

Correlations		Family Income	Family Expenditure
Total income of family	Pearson Correlation	1	.482[**]
	Sig. (2-tailed)		.000
	N	156	156
Total yearly expenses of family	Pearson Correlation	.482[**]	1
	Sig. (2-tailed)	.000	
	N	156	156
**. Correlation is significant at the 0.01 level (2-tailed).			

The Table 45 shows Karl Pearson correlation coefficient (r_p) is 0.482 and Sig value (p value) is 0.001. A Karl Pearson correlation was run to determine the relationship between 156 household total yearly income and total yearly expenses. There was positive correlation between variables and statistically significant, r_p= 0.482 and p=0.001 (<0.05). The total income of the family associated at medium with total yearly expenses of the family.

Table 46: *Annual Farm Expenses and Annual Average Farm Income*

Correlations		Farming Expense	Farm Income
Total expenses for apple farming	Pearson Correlation	1	.809[**]
	Sig. (2-tailed)		.000
	N	156	156
yearly average income from apple farming	Pearson Correlation	.809[**]	1
	Sig. (2-tailed)	.000	
	N	156	156
**. Correlation is significant at the 0.01 level (2-tailed).			

The Table 46 shows Karl Pearson correlation coefficient (r_p) is 0.809 and Sig value (p value) is 0.001. A Karl Pearson correlation was run to determine the relationship between 156 household total yearly expenses and yearly average income from the apple farming. There was strong positive correlation between variables and statistically significant, r_p= 0.809 and p=0.001 (<0.05). The total expenses of the apple farming are strongly associated with the yearly average income from apple farming.

4.4.2 Significance Difference Test

Table 47: *Normality Test*

Statistics	village	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Total income of family	Marpha	.228	60	.000	.661	60	.000
	Tukche	.186	48	.000	.878	48	.000
	Syang	.131	48	.039	.945	48	.025
a. Lilliefors Significance Correction							

The Table 47 illustrates that for the Marpha, Tukche, Syang village the dependent variable, 'yearly average income from apple farming' was not normally distributed. But

somehow, Syang yearly average income is closed to the normal distribution because its sig (p) value is 0.025. If the Sig.value (p-value) of the Shapiro-Wilk Test is greater than 0.05, the data is normal. If it is below 0.05, the data significantly deviate from normal distribution.

4.4.3 Multivariate Analysis: Regression Analysis

- Average yearly income and yearly expenses on apple farming

Table 48: *Model Summary I*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.869[a]	.756	.748	332373.886
a. Predictors: (Constant), Yearly expenses for experties visit on farm, Yearly expenses for fertilizers/pesticide/Vitamin, Yearly expenses for new seeds, Yearly expenses for Irrigation purpose, Yearly expenses for labour				
b. Dependent Variable: yearly average income from apple farming				

Source: *Field Survey, 2021*

The Table 48 shows multiple correlation coefficient, R=0.869 and R^2 =0.756 >0.08.We can see from the value of 0.756 that the independent variables explain 75.6percent of the variability of the dependent variable, yearly average income from apple farming.

Table 48.1: *ANOVA Table*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	51291962405464.560	5	10258392481092.912	92.859	.000[b]
	Residual	16570860030433.031	150	110472400202.887		
	Total	67862822435897.590	155			
a. Dependent Variable: yearly average income from apple farming						
b. Predictors: (Constant), Yearly expenses for expertise visit on farm, Yearly expenses for fertilizers/pesticide/Vitamin, Yearly expenses for new seeds, Yearly expenses for Irrigation purpose, Yearly expenses for labour						

Source: *Field Survey, 2021*

The *F*-ratio in the **ANOVA** table tests whether the overall regression model is a good fit for the data. The Table 48.1 shows that the independent variables statistically significantly predict the dependent variable, $F(5, 150) = 92.859$, $p=0.001 <0 .05$ (i.e., the regression model is a good fit of the data).

Table 48.2: *Coefficient Table*

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0percent Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	146825.335	36597.269		4.012	.000	74512.596	219138.074
	Yearly expenses for	1.129	.601	.116	1.8	.0	-.059	2.317

51

				78	62		
new seeds							
Yearly expenses for fertilizers/pesticide/ Vitamin	.596	.199	.147	2.9 90	.0 03	.202	.989
Yearly expenses for Irrigation purpose	30.398	6.279	.361	4.8 41	.0 00	17.992	42.804
Yearly expenses for labour	2.479	.465	.453	5.3 29	.0 00	1.560	3.398
Yearly expenses for expertise visit on farm	-6.090	6.245	-.089	- .97 5	.3 31	-18.430	6.250
a. Dependent Variable: yearly average income from apple farming							

The coefficient table 48.2 shows constant =146825.335 (unstandarized coefficient B). For independent variables expenses for seed, Unstandarized B= 1.129, and Standarized B=0.116, t=4.012, sig (p) value=0.62. For fertilizers/pesticides/vitamins, unstandarized B= 0.596 and stanadarized B= 0.147, t=2.990 and sig =0.03. For irrigation, unstandardized B= 30.398 and standardized B=0.361, t=4.841, sig=0.00. For labour, unstandarized B=2.479, standardized B=0.453, t=5.329 and sig= 0.00. For, expertise visit, unstandarized coefficient B= -6.09, standardized B= -0.089, t=-0.975 and sig 3.31. The coefficient table helps to determine the regression equation which can be described as: $y = a + bx$

Where,

y = dependent variable,

x = independent variable,

a = y-intercept and

b = slope of the line

The table represents regression equation as:

$$yearly\ average\ income\ from\ apple\ farming$$
$$= 146825.335 + 1.129(new\ seeds) + 0.596(fertilizers)$$
$$+ 30.398(irrigaton) + 2.479(labour) - 6.09(expertise)$$

From table and equation one can observed that the dependent variable yearly average income from the apple farming is highly described by independent variable yearly expenses for irrigation purpose and least described by yearly expenses on expertise visit.

- **Yearly average income from apple farming and capital debt of the farmers**

Table 49: *Model summary II*

Model Summary[b]									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.679[a]	.460	.450	490831.246	.460	43.229	3	152	.000
a. Predictors: (Constant), Capital debt for Relatives, Capita debt for Bank, Capital debt for Cooperative									
b. Dependent Variable: yearly average income from apple farming									

Source: *Field Survey, 2021*

The Table 49 shows multiple correlation coefficient, R=0.679 and R^2 =0.460 .We can see from the value of 0.460 that the independent variables explain 46.0 percent of the variability of the dependent variable, yearly average income from apple farming

Table 49.1: *ANOVA Table*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31243694997920.504	3	10414564999306.834	43.229	.000[b]
	Residual	36619127437977.090	152	240915312091.955		
	Total	67862822435897.590	155			
a. Dependent Variable: yearly average income from apple farming						
b. Predictors: (Constant), Capital debt for Relatives, Capita debt for Bank, Capital debt for Cooperative						

Source: *Field Survey, 2021*

The *F*-ratio in the **ANOVA** tests whether the overall regression model is a good fit for the data. The Table 49.1 shows that the independent variables statistically significantly predict the dependent variable, $F(3, 152) = 43.299, p=0.001 < .0005$ (i.e., the regression model is a good fit of the data).

Table 49.2: *Coefficient Table*

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0percent Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	329218.562	47713.252		6.900	.000	234951.780	423485.344
	Capital debt for Cooperative	.743	.238	.189	3.128	.002	.274	1.213
	Capita debt for Bank	1.389	.127	.659	10.906	.000	1.137	1.640
	Capital debt for Relatives	1.251	.310	.242	4.030	.000	.638	1.864
a. Dependent Variable: yearly average income from apple farming								

Source: *Field Survey, 2021*

The Table 49.2 shows constant (unstandarized coefficient B)= 329128.562, t=6.900, sig=0.000. For capital debt Cooperative, unstandarized coefficient B=0.743, standarized coeffiecient B=0.189, t=3.128 and sig=0.002. For capital debt for Bank, unstandarized coefficient B=1.389, standardized coefficient B=0.659, t=10.906 and sig=0.000. For capital debt for Relatives, unstandarized coefficient B=1.251, standardized coefficient B=0.242, t=4.030 and sig=0.000.

The table represents regression equation as:

$$Yearly\ average\ income\ from\ apple\ farming$$
$$= 329219 + 0.743(Cooperative) + 1.389(Bank) + 1.251(Relatives)$$

The table and equation shows among all the independent variables, capital debt for bank described more to the dependent variable yearly average income from apple farming.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS AND IMPLICATIONS

5.1 Summary of Findings

- Of the total 156 respondents, 108 were belonging to Gharpjong rural municipality and 48 were belonging to Thasang rural municipality.
- The majorities (67.7 percent) of the age group fall between 41-60 years in which 29, 28 and 33 farmers were belonging to Marpha, Tukche and Syang village.
- The ratio of male and female farmer is 4.20:1. About marital status, more than 94 percent of total respondent are married and rest are the widow and unmarried.
- Majority (80 percent) respondents were belonging to Janjati ethnic group
- More than fourth-fifth (80.8 percent) follow Buddhist religion
- More than third- fourth (76.9 percent) speak Thakali as mother tongue
- Most (30.1 percent) respondents completed primary education whereas 20 percent were illiterate
- Majorities (69.9 percent) respondents have joint family system
- The average khet of the farmer is 11.59 ropani, bhari 2.08 ropani and leased land 3.52 ropani.
- About 89 percent of the families have food sufficiency producing own from farm for less than 9 months. 41.0 percent less than 6 months, 48.7 percent 6-9 months, 8.3 percent 9-12 months and 1.9 percent more than 12 months.

Private Return Analysis

- As household members of the respondent engaged in different types of the occupation, so the income source for the family also diversify. The average income from agriculture is Rs. 678076.92, business Rs. 457733.33, remittance Rs 722321.43, private job Rs. 265789.47, public job Rs. 369166.67 and entrepreneur Rs. 825000.00.
- The household expenses on different items were different. The largest mean expenses RS. 202243.59 were made on food. The second expenses Rs. 139967.53 were made on children education. Expenses Rs. 43987.10 on the clothes, Rs. 49694.44 on travelling/pilgrimage, Rs. 58741.01 oh health/medicine and Rs.13660.18 on philanthropy purpose.
- more than half (55.8 percent) farmers have been involved in commercial farming for 11-20 years, and 29.5 percent for 21-30 years, 12.2 percent more than 31 years, and 2.6 percent below 10 years. The average mean years of involvement are 22.11 years.
- The highest average expenses were on fertilizers/pesticides/vitamin worth of Rs. 133807.69, Rs. 43478.26 for new seed, Rs. 90445.51 for labour, Rs. 7294.87 and Rs.7953.06 for irrigation and expertise visited.

- 81.4 percent (127 numbers) of farmers have received different kinds of assistance from PAMP, whereas, 18.6 percent (29 numbers) of farmers have not yet.
- The mean capital debt of farmers for Cooperative, Bank and Relatives are Rs. 421052.63, Rs. 616285.71 and are Rs. 374375.00.
- On the family member access to nutritional food and fruits, 20.5 percent strongly agreed, 60.9 percent agreed, 6.4 percent neutral, 12.2 percent disagreed.
- On the family quality life improvement, 39.1 percent strongly agreed, 41.0 percent agreed, 8.3 percent neutral and 11.5 percent disagreed.

Social Return Analysis

- Compost fertilizers were prepared by 94.9 percent of the total farmers and 29.5 percent sell the product and 60.9 percent did not sell yet.
- The mean statistics of student visited in the farm is 127.05, farmer 105.51, researcher 7.98, officers 16.90.
- 96.2 percent of the total farmer linked with farmer group, 42.9 percent in cooperative group, 26.3 percent in school management community, 26.9 percent in youth club.
- 54.0 percent of the total farmers agreed with the shortage of manpower, more than 95.0 percent agreed with the shortage of storage house, more than 90.0percent agreed with the presence of insects and diseases problems, about 60.0 percent agreed with shortage of fertilizers and vitamins, more than 98.0 percent agreed with climate change impact in the apple farming and 56.4 percent agree with the poor infrastructure.
- 81.4 percent of the total farmers did not face any difficulties related apple farming during COVID-19, 14.1 percent faced the shortage of the manpower, 10.0percent faced shortage of vitamins, fertilizers, pesticides, and 7.7percent faced shortage of agriculture tools.
- Myagdi and Kaski were two major potential markets, 73.3 percent of farmer apple goes to Myagdi and Kaski to 69.9 percent. For Kathmandu 36.5 percent, Inside district 48.7 percent, and other district 20.05 percent.
- Two marketing channels were found in the study area in which channel A was found more profitable than channel B. In channel A, producer's share is 100 percent, and in channel B, producer's share is 56.63 percent.

Relationship Test

- Speaman's correlation coefficient between the variables involvement years and yearly average income from apple farming (r_s) = 0.33, Sig (p) value=0.00<0.00
- Karl Pearson's correlation coefficient between the variables total yearly income and total yearly expenses of the family (r_p) = 0.482, Sig (p) value=0.001<0.05

Average yearly average income from apple farming' was not normally distributed as Sig (p) value =0.00<0.05

- Karl Pearson's correlation coefficient between the variables total expenses of the apple farming are strongly associated with the yearly average income from apple farming r_p= 0.809 and p=0.001 (<0.05)
- For the multiple regression models, dependent variable yearly average income from the apple farming is highly described by independent variable yearly expenses for irrigation purpose.
- The dependent variable yearly average income from apple farming is highly described by independent variable capital debt for bank

5.2 Discussions of Findings

Agriculture is still a major source of income for individuals in rural areas, with more than two-thirds of rural residents relying on it for their living (Chapagain, 2015), and in my study I found out, 80 percent of total population of the district engaged in it. (Mellor, 2017) emphasized the interplay between agriculture and the rest of the economy, such as agriculture and foreign exchange, agricultural and capital formation, and alternative industrial capital uses. Mustang's farmers have made capital formation by selling their agriculture products to the market. According to the Schultz concept, it is pointless to supply enough land to farmers who are bound by tradition (Lekhi, 2008). I disagree with this assertion; it is vital to simplify to farmers that they must transition from traditional to modern farming. If there is fertile barren land available, let the farmers allocate it, so, they could maximize their productivity. Integration of livestock and cropping systems has the potential advantages of enhancing nutrient cycling efficiency, adding value to grain crops, and providing a use for forages and crop residue, but in recent time, most of the farmers in the were not engaging on livestock as much as decade back because of shortage of forage and pasture land.

It is critical to improve the living standards of farmers and expand employment opportunities for persons living in rural areas. It's also vital to realize that domestic apple production must compete with imports, thus price becomes a key concern for consumers when purchasing fresh apples. We can see that the trade gap is expanding, and demand for apple fruit is increasing, implying that domestic production needs to be increased. Therefore, government, researcher, technician and the farmers worked together to increase the production scale of apples. The initial long-term vision of the APP (1997-2017), which could be seen in the district instance, was to boost agricultural productivity. In the case of the district, farm product productivity was increasing. Farmers were familiar with technologies, knowledge related new diseases, insects, new variety of apple.

The strategic framework ADS also has developed and implementing Prime Minister Agriculture Modernization Program (PMAMP). It has emphasized on four types of production, processing and industrial centers have been determined by Pocket, Block,

Zone and Super Zone in order to commercialize the agricultural sector. In Mustang also, it has established Apple zone in 2075 B.S in order to modernize, commercialize and industrialize the apple farm and increase the productivity. The PMAMP was introduced with a clear and specific road map for increasing agriculture production and productivity to make the country self reliant in agriculture production and live stock within a decade. This project assisting farmers through technical & financial assists, training, tools and technologies. The small numbers of farmers were not getting such assists from my study area.

Stringer (2001) claims that the agricultural sector in emerging countries plays an essential role in societal wellbeing. Even in the period of a COVID-19 pandemic, it played important role to the national economy than other economic sectors. Agriculture, for example, can operate as a "buffer, safety net, and economic stabilizer" amid an economic downturn, an external income shock, or a financial crisis. Majority people from the district are functioning as both farmers and hotel/restaurants/shopkeeper operators in recent time. During pandemic, all the activities were halt but farming was continuously functioning. Therefore, agriculture to some extent recovers the financial loss of the locale. Tourism adds up a market potential for apples produced in this district (Kadka, 2019) which is true. Many visitors have been bought apples and its byproduct from the market. The farmers get direct and more profit rather than from retailers. Tourism is supporting farming and the farmers. Meanwhile, apple farming adds more charm in the beauty of the district.

The region of Asia Minor, the Caucasus, Central Asia, Himalayan India, Pakistan and western China are the primary centre of origin of apple, where at least 25 native species of *Malus* are found (Juniper et. al., 1998). Apple is a prominent and one of the important prioritized high value cash crops in the high hills of Nepal (APP, 1995), which is true that Mustang being mountain regions produced 5500 metric tons apples. Nepal mountainous region from East to West has great scope for apple production due to relatively temperate weather and favorable climatic conditions. (Pokos, 2012) reported that the most important factors for producing apples are soil, climate, terrain position and agro techniques. These all factors are met up by the district lower part. Apples are rich in nutrients, notably vitamin C, but they are heavy and have a short shelf life (Boyer & Liu, 2004). As a result, most of these fruits are consumed raw, although some are processed into juice, dried apple slices, and other items. Even apple farmers from the study area prepared apple liquor, dried apple slices and cider which supported them to generate extra income. This study observed that storage house is inevitable in the area, so, the apple could be saved for the long duration. (Khanal, 2014) stated that other apple byproducts such as juice, cider and air dried apple slices are getting good market value among domestic consumers, mostly the apple liquor is popular among the tourist which I observed from my field visit. An increase in the number of apple plants lead to the

decrease of the average production cost. (Mehta et al., 2013) revealed the evidence that the farmers having more than 500 plants in their orchard had to bear significantly lower cost. The big farmer of the agreed with the statement because it took almost same effort either you planted few or large number of apples. It was reported that the marketing channel that involved transaction of apples from producer to primary wholesaler, secondary wholesaler, retailer and consumer is most efficient (Chand et al., 2017). But, the studied identified only two marketing channels in the study area. And, marketing channel A gives more profit share to the farmers, however, selling amount is relatively low.

However, there is not always high yield production of the apple because of the low productivity. The factors behind it might be less aware about scientific agro commercial practices, poor infrastructure, climatic factors etc. The farmers are lack behind of adequate knowledge on when or how to efficiently irrigate, fertilized and prune their apple trees (Subedi *et al.*, 2016). These all factors mentioned above frequently faced by small number of farmers who are producing traditionally and produced low volume.

The increased temperature, drying up of existing water, frequent and increased Northern wind, high speed wind, less snowfall and long drought spells are the major climate hazards in Mustang district contributing on declining the productivity of the apple (Khnal, 2014). In the year 2021, continuous rainfall in the month of Sep, affected the apples. This problem results the poor color and size of the apple. Apple marketing may be hampered by a number of factors. Lack of transportation, lack of market knowledge, perishability of product, lack of packing materials, lack of processing facility, price instability, and lack of storage facility were recognized as the primary marketing challenges of apple in Mustang district, Nepal (Amgai et al., 2015).In my study, I found out retailers domination on price bargaining which compel the farmers to sell an apple to the retailers in lower price than its farm gate price.

The promotion of apple growing in Nepal was hampered by a number of factors. Small landholding and farmers' obligations to grow staple food crops, relatively longer gestation period of fruits, lack of technical know-how, unfavorable climatic conditions such as hailstone and erratic rainfall, higher incidence of pests, lack of quality saplings and other inputs, and damage by wild animals are the major farm-level problems affecting apple production in Nepal (Shahi, 2005). The lack of inputs was identified as the key issue in this. In statistics, normality tests are used to determine if a data set is well-modeled by a normal distribution and to compute how likely it is for a random variable underlying the data set to be normally distributed. While plotting normality test of three villages Marpha, Tukche and Syang with dependent variable "yearly average income from apple farming", the data was not normally distributed as sig (p) value were less than 0.005.

5.3 Conclusions

The main sources of income of the Mustang district are Tourism and Agriculture. Among agriculture, apple farming dominate to other crops farming. Apple farming was introduced in the district in 1960's, till then farmers are practicing continuously and recently they are well educated and trained and they are facilitated with tools. It has play significant role in the economy of the district. Majority of household from the study area are earning their livelihood from it, has created seasonal employment opportunities for the labour. Since, it roles on economy is significant, now the concerning government bodies support them to tackle down problems related to the apple farming. Storage house is inevitable in the district, reasonable market price, high transportation cost should be studied, awareness camping related to apple diseases and insects, climate change impacts. Mustang district lies in the Trans Himalaya region that means here temperate climate exists. Moreover, its geography structure is not suitable for cultivating all types of the crops. However, among the crops cultivate here, apple farming is more profitable than other crops and fruits farming. It can be seen from available data and information.

The farmers have interlinked the farming and business such as hotel and tourism. Most of the farmers to whom information was collected, they have diverse income options. They not only engaged in agriculture but also other sectors like business, foreign employment, private and civil job. The farmers have limited scope to sustain their livelihood so that have to engage in other sectors. But my study showed that agriculture, business (hotels/restaurants) and remittance have strongly contributed to the respondent households. The study showed farmers have managed of loan from different bank, cooperatives, relatives, own saving for the investment in commercial apple farming. There were different types of cost associated in the apple farming, among them, farmers have to invest large on vitamins/ fertilizers/pesticides and labour wages.

There are two channels for selling apple. Channel A (farmer- consumer) and Channel B (farmer- retailer- consumer), Channel A is more profitable. During COVID-19 duration, the farmer did not faced severe difficulties while cultivating and harvesting apple but did not get any financial compensation or aids from governmental and non-governmental bodies.

5.4 Implications

For Knowledge Level;

- The study might be useful for knowing general characteristics of the farmers of the researched area.
- This study also highlighted the overall agriculture literature review. Such highlighted agriculture literature review could be useful for others knowledge.
- Moreover, it accounted the agricultural related data reported by MoF, MoALD, economic forum etc. Such data could be significant for the students who are interest on such field.
- This research paper might be applicable to the farmer groups so, they could make some relevant decision related to apple farming based on this paper.

- The relationship test calculated on this paper let the people know how one variable described the other variables. Based on it, the researcher and policy maker will help to the farmers to make appropriate actions.

For Practice Level;

- This research paper might be applicable to the Ward office and Municipality from the study area, this paper could support on policy making of the municipality and ward to some extent.
- The ward office and municipality have the agriculture section that looks after their respective area. They function to uplift the agriculture sector of their area. The data analysis results from the research paper might be helpful to the officers and local elective bodies to understand in-depth the status of the apple farming of the researched area.
- Temperate horticulture development center (THDC) is located at Marpha. As the paper have mentioned the disease and insects related to the apple farming. So, the expertise from such institution should function effectively overcome such problems based on the paper findings.
- The modern equipped storage house is inevitable in the study area. So that farmers can make more profit by selling their products during off season.
- The developing of infrastructure for grading, packing, precooking, and storage of produce, as well as the adoption of post-harvest management measures, needs concentrated developmental attention.
- Because the land is fixed, the Nepalese government should encourage the use of fertilizer, which it can accomplish by providing incentives to deliver fertilizers to households at a reasonable price, so increasing productivity.
- The apple plants from the study area were affected by diseases and insects, therefore, concern governmental body should manage of field visits by technician, expertise. They should teach the farmers the process of coping with them.
- The agriculture system is gradually influence by the global warming and climate change impacts. The awareness program should operate to educate the farmers about climate change. The concern organization should suggest them to plant new variety of plants that are climate change resistance.
- The government should provide the farmers the subsidy and low interest loan, tools and technologies in order to enhance the productivity. Even, the government should encourage the private sector to invest in credit facilities such as small–scale banks that can provide farmers with loans at reasonable rates. This should be accomplished by legislation that makes credit generation easier

For Policy Level;

- The governing body of the researched area could make plan and policies for increasing the agriculture productivity, self-reliant, self-sufficient. I hoped this paper findings could be helpful for them while making plan and policies.

- The Ministry of Agriculture and Livestock Department (MoALD) is the main body of the government to function related to the agriculture. (MoALD) and its sub-bodies make plan and polices at high level. They allocated the budget to the agriculture sector, prepared agriculture report overall of the country. The findings could be helpful to them while they are preparing report, plan and policy related to the apple farming of the study area.
- This research paper might be applicable to the PMAMP Mustang office. They are doing different programs under the guidelines of PMAMP, so hopeful, this paper could be helpful for them to extract new finding.
- Not all the farmers were receiving the PMAMP assists, the finding of this paper discovered that still some of the farmers were leftover. So the PMAMP should find out to them and assist them based on the finding.
- The district agriculture office (DAO) can extract the finding of this paper before making some policy level decision related to the apple farming.
- This paper highlighted that the apple farming is more profitable than other agriculture farming. Based on it, DAO should work to increase the productivity maintaining the quality. The prime focused of DAO should be apple farming.
- The district arable lands are limited. The building structures are built up on the arable lands which is the great threat to the district agriculture scenario. So, DAO, PMAMP and the farmers worked combined to stop the decline of the arable land of the district.

REFERENCE

Agri-Business Promotion and Statistics Division [ABPSD]. (2017). *Statistical information on Nepalese agriculture 2015/2016.* Government of Nepal.

Agriculture Development Strategy [ADS]. (2013). *Preparation of the agriculture development strategy- Assessment Report.*

Amgai, S., Dutta, J. P., Regmi, P. P., & Dangol, D. R. (2015). Analysis of marketing practices of apple in Mustang district of Nepal. A*gric. Development Journal, 11*:2091-0746.

Anonymous (2010). *Statistical database*. http://www.fao.org.

Agriculture and Food Industry (2016). *Apple production in Turkey.* 27th International Scientific-Expert Congress. 26-28 September 2016, Bursa-Turkey', 147-51.

Asian Development Bank [ADB]. (2018). *Macroeconomic update*.

Atreya, P.N., & Kafle, A. (2016). *Production practice, market and value chain study of organic apple of Jumla*. https://www.researchgate.net/publication/326543515.

Basnet,B.B. (1995). *Nepal's agriculture sustainability and intervention: Looking for new direction.*

Best, J. W., & Kahn, J. V. (2004). *Research in education*. Prentice Hall.

Boyer, J., & Liu, R. H. (2004). Apple phytochemicals and their health benefits. *Nutrition Journal, 3*(5):1-15.

Cenral Bureau of Statistics [CBS]. (2011). *National census of agricultural raw statistical estimate*. Central Statistics Department, Government of Nepal.

Chambers, R. & Conway,G. (1992). *Sustainable rural livelihoods: Practical concepts.*

Chand, H., Guleria, C., Guleria, A. & Kashyap, R. (2017). Resource use efficiency and marketing analysis of apple crop in Shimla district of Himachal Pradesh. *International Journal of Farm Science, 7*(1), 154-159.

Chapagain, B. (2015*).* Withdrawing from agrarian livelihoods: Environmental migration in Nepal. *J. Mt. Sci., 12*, 1–13.

Chase, S. E. (2011). Narrative inquiry: still a field in the making. In N. K. Denzin& Y.S., Lincoln (Eds.), *handbook of arts in qualitative research* (117-125). Sage Publications.

Clay, E. (2002). *Food security: Concepts and measurement.* Paper for FAO Expert

Constitution (2015). *New constitution of Nepal*, 2072 BS. Lumbini Pustak Pasal.

Creswell, J. W. (2007). *Qualitative inquiry and research design*. Sage Publication.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative and mix methods approaches* (3rd ed.). Sage Publication.

Department of Agriculture [DAO]. (2018). *Final report: Inter provincial dependency for agriculture development.*

Dawson, V. (2007). *Exploring students' learning experiences through narrative tales*. In P.C. Taylor & J. Wallace (Eds.), *Contemporary qualitative exemplars for science and mathematics research educators* (83-91). Curtin University of Technology.

Fadavi, R., Keyhani, A. & Mohtasebi, S. S. (2011). *An Analysis of Energy Use, Input Cost And Relation Between Energy Inputs and Yield of Apple Orchard*. Research in Agricultural Engineering, 57(3): 88-96. Doi: https://doi.org/10.17221/0/2010-RAE

Food and Agriculture Organization [FAO]. (1983). *World food security: A reappraisal of the concepts and approaches. Director Generals Report*, Rome.

Food and Agriculture Organization [FAO]. (2016). *A scheme and training manual on good agricultural practices for fruits and vegetables.*

Food and Agriculture Organization [FAO] & United Nations Development Programme[UNDP]. (2003). *Agricultural policy and strategy for poverty alleviation and food   security.* FAO, Rome.

Food and Agriculture Organization [FAO], (2010). *Statistical database*. http://www.fao.org in 7th June.

Fruit Development Directorate [FDD]. (2016). *Temperate fruit production technology*. http://www.fdd.gov.np/downloadfile/temperatefruits.pdf

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). Sage Publication.

Harris, D. R. (1973). The prehistory of tropical agriculture: an ethno ecological model, in C. Renfrew (Ed.), *The explanation of culture change (*pp. 391-417). Duckworth.

https://www.weforum.org/agenda/2021/03/countries-food-security-index-ranked-chart

International Fund for Agricultural Development [IFAD]. (2015). *Building a poverty-free world; Enabling poor rural people to overcome poverty in Nepal*.

John, R., Hanson, J. D., Donald, L., & Sassenrath, G. (2008). Principles of integrated agricultural systems: Introduction to processes and definition. *Renewable Agriculture and Food Systems, 23*(4); 265–271. Doi:10.1017/S1742170507001718

Joshi, A. L. (1991). *Community Forestry: Refocusing the Needs*. Paper presented at Review and Planning Workshop on Decentralized Resource Management, 5-7 June 1991, Centre for Economic Development and Administration, Tribhuwan University Kathmandu, Nepal.

Joshi, G. R. (2018). *Agricultural economy of Nepal: Development challenges and opportunities*. Sustainable Research and Development Centre.

Juniper, B. E., Watkins, R. & Harris, S. A. (1998). *The origin of the apple. Acta Horticulture, 484*(1), 27-48. Doi: https://doi.org/10.17660/ActaHortic.1998.484.1

KC, K., Poudel, K. R., Poudel, N., Pokharel, R. P., & Koirala, S. (2014**).** *Resource mapping report*. District Development Committee Mustang.

Khadka, B. (2019). Apple value chain analysis of two mountainous district in Nepal. *Journal of Agricultural and Crop Research. vol. 8*(1), 1-10.

Khanal, U. (2014). Perception and adaptation of the producers to the impacts of climate change in Apple production: An assessment of Mustang District. *Journal of Agriculture and Environment Vol:15,* Jun.2014

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, (30), 607-610.

Lekhi, R. K. (2008). *The economics of development and planning* (11th ed.). Kalyani Publishers.

Local Initiatives for Biodiversity Research and Development [Li-Bird]. (2019). *Global hunger index 2019*. Nepal.

McClain, N. (2004). *Implementing a human rights approach to food security*. Africa Conference IFPRI, Policy Brief 13

McClenaghan, P. (2000). Social capital: Exploring the theoretical foundations of community development education. *British Educational Research Journal, 26*(5), 565-582. http://www.jstor.org/stable/1501991 Accessed: 29-06-2018 15:51 UTC

Mehta, P., Thakur, R. K. & Chauhan, S. (2013*).* Production and marketing of apple fruit crop - A study premise to Shimla district of Himachal Pradesh. India. *International Journal of Bio-resource and Stress Management, 4*(4), 610-613.

Mellor, J. W. (2017). *Agricultural development and economic transformation, palgrave studies in agricultural economics and food policy*. Cornell University Publication. https://doi.org/10.1007/978-3-319-65259-7_1

Ministry of Agricultural Development [MoAD]. (2017). *Agri-business promotion and statistics*. Government of Nepal.

Ministry of Agriculture and Livestock Development [MOALD]. (2018/19). *Statistical information on Nepalese agriculture*.

Ministry of Finance [MoF]. (2018). *Economic survey*, 2017/18. Government of Nepal.

Ministry of Finance (MoF). (2020). *Economic survey*, 2019/20. Government of Nepal.

Ministry of Health [2020]. *Nepal Coronavirus update 05 December*. Department of health. Government of Nepal.

Ministry of Agriculture [MOA]. (2014). *Twenty years agriculture development strategy* (2014-34). Government of Nepal.

Ministry of Agriculture and Development [MoAD]. (2015/16). *Statistical information on Nepalese agriculture*. Monitoring Evaluation and Statistics Division.

Market Research & Statistics Management Program [MRSMP] (2016). *Average cost of production and gross profit from fruit farming in Nepal* (2015/16).

Nepal Rastra Bank (NRB). (2019). *Current macroeconomic and financial situation of Nepal* (Based on Six Months' Data of 2018/19). Kathmandu: Research Department Nepal, Kathmandu.

OECD-FAO (2013). *Agricultural outlook*, 2013-2022. Corrigenda OECD Publication.

OHCR Fact Sheet No. 16 (Rev.1): *The Committee on Economic, Social and Cultural*

OXFORD ENGLISH DICTIONARY. 1971. *The Oxford English dictionary*. Oxford University Press.

Pingali, P., Alinovi, L., & Sutton,J. (2005). Food Security in complex emergencies: enhancing food system resilience. *Disasters, Volume 29*, June 2005.

Pokos, N. V. (2012). Ecological fruit production-apple. *Glasnik Zastite Bija. 35(3): 91-91*. http://hrcak.srce.hr/163066

Preston, T. R. (1995). Research, extension and training for sustainable farming systems in the tropics. *Livestock Research for Rural Development, 7*(2)1-8.

Rajbhandary, H.B. & Shah, S.B. (1981). Trends and projections of livestock production in the hills. In *Nepal's experience in hill agriculture development*.

Rana, S.S. & Chopra, P. (2013). *Integrated farming system*. Department of Agronomy, COA,CSK HPKV, Palampur-176062.

Rimando, T. J. (2004). *Crop science 1: Fundamentals of crop science.* University Publications Office. p.1.

Rubenstein, J. M. (2003). *The cultural landscape: An introduction to human geography*. (7th ed.). Upper Saddle River, NJ: Pearson Education, Inc. p. 496.

Sharma, P. (2007). *A handbook of social science research methodology* (3rd ed.). Kriti Prakashan.

SNV Nepal (2011). *A value chain analysis of apple from Jumla*. SNV

Stringer, R., (2001). *How important are the "nontraditional" economic roles of agriculture in development?* Discussion Paper No. 0118, Adelaide University.

Subedi, G. D., Gautam, D. M., Baral, D. R., KC, G.B., Paudyal, K. P. & Giri, R. K. (2016). Evaluation of cushioning for transportation of apple cultivars from orchard to collection cente*r. International Journal of Horticulture, 6*(26): 1-8. *systems.*

Thapa, P. K, Saraf, D, & Gaire, K.R. (2004). *Commodity case study: fruits Implications of the WTO Membership on the Nepalese Agriculture.*

Thapa, S. (2009). *Three essays on Nepalese development: Technology adoption, agricultural risk and the effects of remittances on recipient households* (Unpublished Doctoral Dissertation, University of Trento). Canada: Doctoral School of Economics and Management.

Ucar, K., Engindeniz, S., Markovic, T. & Kokot, Z. (2016). *Analysis of changes in eradication of hunger and malnutrition",* Rome.

United Nations [UN]. (1948). *The Universal Declaration of Human Rights.* https://www.un.org/en/about- us/universal-declaration-of-human-rights

United Nations [UN]. (2015). *The 2030 agenda for sustainable development*. https://sustainabledevelopment.un.org/post2015/transformingourworld

Wang, N., W., J. & Zhang, F. (2016*). Towards sustainable intensification of apple*

Wani,F.A, & Songara, M. (2018). Status and position of apple crop in area, production and productivity in Himachal Pradesh. *International Journal of Multidisciplinary Research and Development, 5*(11), 106-111

Webster, L., & Mertova, P. (2007). *Using narrative inquiry as a research method: An introduction to using critical event narrative analysis in research on learning and teaching.* Routledge/Taylor & Francis Group. https://doi.org/10.4324/9780203946268

World Bank [WB]. (2020*). Covid-19 impact on Nepal's economy hits hardest informal sector*. World Bank Group.

World Bank [WB]. (2008). *World development report on agriculture for development.* The World Bank Group.

World Food summit (1996). *Rome declaration on world food security.*

Worldometer (2020). *Covid-19 Coronavirus pandemic update 3rd December.*

Yazan, B. (2015). Three approaches to case study methods in education: Yin, Merriam, and Stake. *The Qualitative Report*, *20*(2), 134-152.

Yin, R. K. (2014). *Case study research: Design and method* (4th ed.). Sage Publication.

APPENDICES

Appendix A: Sampling Determination Table

Required Sample Size					
Confidence =	**95.0percent**	3.84			
Population Size	Degree of Accuracy/Margin of Error				The recommended sample size for a given population size, level of confidence, and margin of error appears in the body of the table.
	0.05	**0.04**	**0.025**	**0.01**	
10	10	10	10	10	
20	**19**	20	20	20	For example, the recommended sample size for a population of 1,000, a confidence level of 95percent , and a margin of error (degree of accuracy) of 5percent would be 278.
30	28	29	29	30	
50	44	47	48	50	
75	63	69	72	74	
100	80	89	94	99	Change these values to select different levels of confidence.
150	**108**	126	137	148	
200	132	160	177	196	Change these values to select different maximum margins of error.
250	152	190	215	244	
300	170	217	251	291	Change these values to select different (e.g., more precise)
400	196	265	318	384	
500	217	306	377	475	
600	234	340	432	565	
700	248	370	481	653	
800	260	396	526	739	
900	269	419	568	823	
1,000	278	440	606	906	
1,200	291	474	674	1067	

Appendix B: Questionnaire

MICROECONOMIC ANALYSIS OF APPLE FARMING DURING COVID-19, IN MARPHA MUSTANG

परिशिष्ट A: घरेलू सर्वेक्षण प्रणाली

आदरणीय उत्तरदाता,

म साझेदारी गर्न चाहन्छु कि यो पूर्णरुपमा शोधप्रबन्ध कार्य हो र यसले कुनै पनि आधिकारिक रेकर्ड बोक्दैन | तपाईलाई प्रश्रको उत्तर मैत्रीपूर्ण र इमान्दारिताका साथ दिन आग्रह गर्दछु | यस अध्ययनको महत्व तपाईको बहुमूल्य उत्तरमा निर्भर गर्दछ | तपाईको गोपनियता सबै सुरक्षित हुनेछ र तपाईले प्रदान गर्नुभएको जानकारीले यसमा असर गर्दैन | त्यसोभए कृपया सकेसम्म तपाईको ज्ञान र अभ्यासमा तलका प्रश्रहरुको उत्तर दिनुहोस् |

नाम : ---सम्पर्क नम्बर : -------------------------------------

स्थाई ठेगाना : -------------------------------प्रदेश---जिल्ला

गाउँपालिकाको नाम : ------------------------------- वडा नम्बर : -------------------------------

खण्ड A समाज र जनसांख्यिकी विशेषताहरु

1. उत्तरदाताको उमेर : -------------------------------------

2. उत्तरदाताको लिङ्ग : ☐ महिला ☐ पुरुष ☐ अरु

3. वैवाहिक स्थिति: ☐ अविवाहित ☐ विवाहित ☐ सम्बन्ध विच्छेद
   ☐ बिधवा ☐ एकल महिला ☐ एकल पुरुष

4. जाति /जातीयता: ☐ ब्राह्मण ☐ क्षेत्री ☐ जनजाति
   ☐ दलित ☐ अरु

5. धर्म : ☐ हिन्दु ☐ बौद्ध ☐ किराँत ☐ इसाई ☐ अरु

6. मातृभाषा : ☐ नेपाली ☐ गैरनेपाली, कृपया उल्लेख गर्नुहोस् ------------------
   ----

7. औपचारिक शिक्षाको स्थिति : ☐ प्राथमिक ☐ तल्लो माध्यमिक
   ☐ उच्च शिक्षा ☐ अशिक्षित

8. कुनैपनि खेती सम्बन्धी प्रशिक्षण तपाईले पूरा गर्नुभएको छ:
   ☐ स्याउ खेती ☐ टनेल तरकारी खेती ☐ एकीकृत किरा व्यवस्थापन
   ☐ बाख्रा खेती ☐ च्याउ खेती ☐ मौरीपालन

9. परिवार प्रणाली: ☐ संयुक्त परिवार ☐ एकल परिवार

10. पुरा महिलाको संख्या,र पुरा पुरुषको संख्या-------------------------

11. विद्यालय जाने बच्चाहरूको संख्या : ☐ सरकारी विद्यालय ...... ☐ निजी विद्यालय.........

12. कलेज जाने बच्चाहरूको संख्या: ☐ सरकारी कलेज/ विश्वविद्यालय.... ☐ निजी कलेज .....

13. पारिवारिक पेशा : ☐ कृषि ☐ उद्यम ☐ व्यवसाय ☐ सरकारी जागिर ☐ निजी जागिर ☐ रेमिट्यान्स

69

14. पारिवारिक वार्षिक आय : ☐ कृषि रु ----------- ☐ व्यवसाय रु-----------
☐ सरकारी जागिर रु------------- ☐ निजी जागिर रु -------------
☐ स्याउ खेती --------------- ☐ उद्यम रु---------------- ☐ रेमिट्यान्स रु----
----

15. पारिवारिक वार्षिक खर्च: ☐ खाना रु.-------------- ☐ कपडा रू.-----------------
☐ सामान /गहना रु.-------------- ☐ बालबच्चाको शिक्षा रु.---------------
☐ घुमघाम तीर्थयात्रा रु.---------- ☐ सांस्कृतिक उत्सव रु.------------------
☐ उपचार/औषधी खर्च रु. -------------- ☐ परोपकार रु.-----------------

खण्ड B: कृषि प्रणाली सम्बन्धित जानकारी

16. भूमि पकड स्थिति (रोपनीमा): ☐ खेत ----------- ☐ बारी ---------- ☐ चरण
जमिन---------- ☐ भाँडाको जमिन-----------

17. जग्गा स्वामित्व प्रकार: ☐ आफ्नो स्वामित्व ☐ लिजहोल्ड ☐ सेयर
क्रपिंग व्यवस्था ☐ साधारण सम्पतिमा पहुँच ☐ अरु

18. तपाईको खेतमा खेतीको प्रकार: ☐ बाली खेती ☐ बगैंचा खेती
☐ घाँस खेती ☐ तरकारी खेती ☐ अरु (उल्लेख गर्नुहोस्)-----------------

19. आफ्नो उत्पादनबाट परिवारलाई खान पर्याप्तता:
☐ ६ महिना ☐ ६ देखि ९ महिना ☐ ९ देखि १२ महिना
☐ >१२ महिना भन्दा बढी

20. मुख्य बाली उत्पादन : ☐ फापर ☐ गहुँ ☐ आलु ☐ गेडागुडी
☐ तरकारी ☐ अरु (उल्लेख गर्नुहोस्)

21. घरपालुवा जनावरको संख्या : ☐ गाई/गोरु ☐ भैसी ☐ कुखुरा/ हाँस
☐ घोडा/ खच्चर/गधा ☐ भेडा/ बाख्रा ☐ अरु (उल्लेख गर्नुहोस्)

22. तपाईको खेतबारीको माटोको प्रकार : ☐ ढुङ्गा ☐ ग्राभेल ☐ मिश्रण माटो
☐ बालुवा ☐ चिसो ☐ अरु (उल्लेख गर्नुहोस्)

23. तपाईको खेतबारीमा सिंचाइको व्यवस्था: ☐ बृहत सिंचाइको व्यवस्था ☐ आकाशे
पानीको भर ☐ दुवै

24. बिउबिजन को व्यवस्थापन: ☐ किनेर ☐ बचत गरिएको बीउ ☐ सरकारी निकाय
बाट प्राप्त बीउ ☐ एनजीओ एनजीओ बाट प्राप्त बीउ

25. के तपाई बारीमा प्राङ्गारिक मलको प्रयोग गर्नुहुन्छ? ☐ गर्छु ☐ गर्दिन

26. के तपाई रसायनिक मलको प्रयोग गर्नुहुन्छ? ☐ गर्छु ☐ गर्दिन

27. तपाई बारीमा कीटनाशक विपादीको प्रयोग गर्नुहुन्छ? ☐ गर्छु ☐ गर्दिन

28. कि वर्षेनी रसायनिक मल र विपादीको प्रयोग क्रमश बढ्दैछ? ☐ छ ☐ छैन

खण्ड C निजी प्रतिफल (आर्थिक र गैर आर्थिक) विश्लेषण

29. कति वर्ष पुग्यो तपाईको स्याउ खेतीमा संगलन भएको?---------------- -------------

30. के तपाईले PMAMP बाट प्राविधिक र आर्थिक सहयोग पाउनुभएको छ?

☐ छ ☐ अहिलेसम्म छैन

31. तपाईको (recurring cost) आवर्ती लागत विभिन्न प्रयोजनको लागि

☐ जग्गा किन्दा ☐ पट्टी जमिन (leasehold land) ☐ आश्रय/आवास

32. व्यवसायिक रुपमा स्याउ खेती गर्दा तपाईको सुरुवाती लगानी?--------------------------

33. व्यवसाय गर्दा लगानीको स्रोत: ☐ आफ्नो बचत ☐ नातेदारबाट ऋण ☐ सहकारीबाट ऋण ☐ बैंकबाट ऋण

34. तपाईको संस्थागत पूंजी ऋण : ☐ सहकारी रु. ☐ निजी बैंक रु. ☐ सरकारी बैंक रु.

35. व्यावसायिक स्याउ खेती लागि औसत वार्षिक परिवर्तन लागत/ खर्च :

☐ वीउ रु.----------- ☐ भिटामिन रु.------------- ☐ सिँचाइ रु.---------------
☐ यातायात रु.------------- ☐ श्रम खर्च रु.--------------- ☐ विपादी रु.------------- ☐ विज्ञका लागि शुल्क रु ----------- ------- ☐ जग्गा कर रू -------------
-----

36. व्यवसायिक स्याउ खेतीबाट औषत वार्षिक आम्दानी रु.-------------------------

37. प्राविधिक सहयोग प्राप्त हुने सरकारी वा गैरसरकारी संस्थाबाट

☐ तालिमको अवसर ☐ अवलोकन भ्रमणको अवसर ☐ प्रशंसापत्र
☐ कृषि उपकरणहरु ☐ माथिको सबै माथिको सबै

38. आर्थिक वित्तीय सहयोग प्राप्त कुनै सरकारी वा गैर सरकारी संस्था बाट

☐ अनुदान ☐ सस्तो ऋण ☐ दैनिक भत्ता ☐ नगद पुरस्कार

39. परिवारका सदस्यहरूसँग विभिन्न प्रकारका पौष्टिक खाना र फलफूलको पहुँच:

☐ पुरा सहमत ☐ सहमत ☐ असहमत ☐ पुरा असहमत
☐ थाहा छैन

40. परिवारको गुणस्तरी जीवनमा सुधार देख्नु भा छ : ☐ पुरा सहमत ☐ सहमत ☐ तटस्थ असहमत ☐ पुरा असहमत

41. स्याउ खेतीको विस्तार गर्ने योजना छ? ☐ छ ☐ अहिलेसम्म छैन ☐ सायद भविष्यमा सायद भविष्यमा

खण्ड D सामाजिक प्रतिफल (आर्थिक र गैरआर्थिक) विश्लेषण

42. तपाइको परिवारको सदस्यहरु कतिजना समावेश हुनुहुन्छ स्याउ खेतीमा -------------------------
महिला................... पुरुप-------------------------------

43. अस्थायीरुपमा कति जना कामदार तपाईको बगैचामा काम गर्छन् ----------------महिला----------------
-पुरुप

44. के स्याउ खेतिको लागि प्राङ्गारिक मल तयार गर्नु हुन्छ?

☐ गर्छु ☐ अहिलेसम्म छैन ☐ गर्ने सोचमा छु

71

45. के तपाईले प्राङ्गारिक मल उत्पादन गरेरबेच्नु हुन्छ?

☐ आजसम्म बेचेको छैन ☐ बेच्छु ☐ बेच्ने सोचमा छु

46. तपाईको बगैचामा कतिजना मानिसहरु आजको मितिसम्म अवलोकन गरेका छन् (संख्या)

☐ विद्यार्थी --------- ☐ जिल्लाका कृषक----------- ☐ बाहिर जिल्लाका
कृषक------ ☐ अनुसन्धानकर्ता -------------- कर्मचारी-----------------

47. समुदायमा आधारित संगठनमा तपाईको सहभागिता छः ☐ कृषक समूह (संख्या)-----------

☐ सहकारी -------------- ☐ गुठी-------------- ☐ विद्यालय------------
☐ उपभोक्ता समूह----------

48. व्यावसायिक स्याउखेती को प्रविधि बर्सेनि बढ्दै छ?

☐ पुरा सहमत ☐ सहमत ☐ थाहा छैन ☐ असहमत ☐ पुरा
असहमत

49. स्थानीय कृषकहरूको एकआपसमा सुमधुर सम्म सम्बन्ध छ

☐ पुरा सहमत ☐ सहमत ☐ थाहा छैन
☐ असहमत ☐ पुरा असहमत

50. स्याउ खेतीले स्थानीय कृषकको पहिचान राष्ट्रिय अन्तर्राष्ट्रिय बजारमा पुर्याउन मद्दत गरेको छ?

☐ पुरा सहमत ☐ सहमत ☐ थाहा छैन ☐ असहमत
☐ पुरा असहमत

51. स्याउ खेतीले स्थानीय कृषकहरुको जीवनस्तर मा सुधार भएको छ?

☐ पुरा सहमत ☐ सहमत थाहा छैन ☐ ☐ असहमत ☐ पुरा
असहमत

52. तपाईको उत्पादित स्याउको सम्भावित बजारः ☐ जिल्लाभित्र ☐ म्याग्दी
☐ कास्की ☐ काठमाडौ ☐ अरु जिल्ला ☐ बाहिर देश

53. तपाई कुन च्यानलबाट आफ्नो आफ्नो स्याउँ बेच्नुहुन्छः

☐ च्यानल A (उत्पादनकर्ता- उपभोक्ता) ☐ च्यानल B (उत्पादक- उपभोक्ता- खुदरा)

54. स्याउको मूल्य स्याउको मूल्यमा दुइटा च्यानलबाट per केजीमा फरक

च्यानल	स्याउभारी को मूल्य रु	खुदरा मूल्य रु	बजार मूल्य	कृषकको फाइदा
च्यानल A				
च्यानल B				

72

55. स्याउ खेती सम्बन्धी समस्याहरु

समस्याहरु	पुरा सहमत	सहमत	पुरा असहमत	असहमत
कामदारको अभाव				
भण्डारणको अभाव				
किराको समस्या				
विषादीको अभाव				
कमजोर प्राविधिक ज्ञान				
कमजोर प्राविधिक ज्ञान				
मौसमी वातावरण समस्या				
कमजोर पूर्वाधार				

56. COVID-19 कोसमयमा, स्याउ खेती गर्दा कुनै समस्या सामना गर्नुपर्यो? ☐ अ ☐ अहँ
(उल्लेख गर्नुहोस्)

57. COVID-19 कोसमयमा, तपाईको उत्पादित स्याउलाई बजारको समस्या थियो? ☐ थिएन
☐ थियो (उल्लेख गर्नुहोस्)

58. COVID-19 कोसमयमा, तपाईको उत्पादित स्याउ खेर गयो उल्लेख गर्नुहोस्? ☐ गयो
☐ गएन (उल्लेख गर्नुहोस्)

59. COVID-19 कोसमयमा, तपाईको स्याउको मुल्य मूल्यमा केहि गिरावट आएको थियो? पहिलो वर्षको
भन्दा : ☐ थिएन --------- ☐ थियो (पहिलो वर्षको मूल्य प्रतिकेजी रु.----------र यो
वर्षको मूल्य प्रतिकेजी रु.---------)

60. COVID-19 कोसमयमा, तपाईको परिवार आर्थिक क्षति कति भयो होला रु.

☐ <१00,000 ☐ १00,000-१,000,000 ☐ १,000,000-२,000,000 ☐ >२,000,000

61. COVID-19 कोसमयमा, तपाईले आर्थिक क्षतिपूर्ति पाउनुभयो?

☐ पाएन
☐ पाए (त्यसोभए , ☐ केन्द्र सरकारबाट रू.---------- ☐ प्रदेश सरकार
रू.-------------- ☐ स्थानीय सरकार रू.--------- ☐ दातृ निकाय रू.-------------)

73

Appendix C: KII Guideline

Indicators	Proving Questions
Private return economic	Recurring cost Annual variable cost of farming Annual earnings from farming Annual household earning Annual household expenditure Technical and financial supports Impact of COVID-19
Private return non-economic	Utilization of land resources Surplus production/food security Food nutrition and quality of life Develop farming skills Develop entrepreneurial skills Increase self confidence Impact of Covid-19
Social return economic	Creating jobs to the others Integrated farming system Commercial farming practices Financial institutions Marketing facilities Cooperation/unity among farmers Impact of COVID-19
Social return non-economic	Social identity Apple zone identity Becoming role model farmer Organic farming practices Increase social status and prestige Involving in exposure visits/seminar Impact of COVID-19

Appendix D: Data Fact and Figures

Table 1: *Annual Percentage Change of GDP*

Years	Annual percent change in GDP
2002/03	3.80
2003/04	4.40
2004/05	3.20
2005/06	3.70
2006/07	2.80
2007/08	5.80
2008/09	3.90
2009/10	4.30
2010/11	3.80
2011/12	4.60
2012/13	3.04
2013/14	4.14
2014/15	3.77
2015/16	3.80
2016/17	4.15
2017/18	3.75

Source: MoF, 2015/16, 2017/18

Table 2: *Top Apple Producer countries in the world for year 2019*

Ranks	Countries	Production in tones
1	China Mainland	42,425,400
2	United States of America	4,997,680
3	Turkey	3,618,752
4	Poland	3,080,600
5	India	2,316,000
6	Italy	2,303,690
7	Iran (Islamic Republic of)	2,241,124
8	Russian Federation	1,950,800
9	France	1,753,500
10	Chile	1,621,321

Source: http://www.fao.org/faostat/en/#rankings/countries_by_commodity

Table 3: *Apple Production in Seven Provinces*

Province	Area	Productive Area	Production	Yield
1	652	455	2853	6.26
2	-	-	-	-
Bagmati	111	78	561	7.16
Gandaki	1606	632	7450	11.79
5	685	348	2570	7.40
Karnali	7221	2331	15388	6.6
Sudurpaschim	912	506	2564	5.07
Total	11,186	4,349	31,386	7.22

Source: MoALD, 2018/19

Table 4: *Apple Production in 11 districts of Gandaki Province*

Apple Production: Area, Productive Area, Production, Yield, 2075/76 (2018/19) Area in Ha, Production in Mt and Yield in Mt/Ha				
Districts	Area	Productive Area	Production	Yield
Gorkha	53.0	41.0	192.0	4.7
Lamjung	12.0	8.0	58.0	7.3
Tanahu	-	-	-	-
Kaski	3.0	3.0	15.0	5.0
Parbat	-	-	-	-
Syanja	-	-	-	-
Manang	220.0	105.0	1312.0	12.5
Mustang	1257.0	445.0	5727.0	12.9
Myagdi	11.0	4.0	23.5	5.9
Baglung	50.0	26.0	122.0	4.7
Nawalparasi East	-	-	-	-

Source: MoALD, 2018/19

Table 5: *Major Apple Production Districts in Different Province of the Country*

Apple Production: Area, Productive Area, Production, Yield, 2075/76 (2018/19) Area in Ha, Production in Mt and Yield in Mt/Ha					
Province	District	Area	Productive Area	Production	Yield
1	Solukhumbu	232.0	200.0	1180.0	5.9
1	Terathum	90.0	65.0	467.0	7.2
1	Khotang	98.0	65.0	469.0	7.2
Bagmati	Rasuwa	87.0	59.0	424.0	7.2
Gandaki	Manang	220.0	105.0	1312.0	12.5
Gandaki	Mustang	1257.0	445.0	5272.0	12.9
Lumbini	Rolpa	230.0	127.0	979.0	7.7
Lumbini	Rukum East	450.0	217.0	1573.0	7.2
Karnali	Kalikot	536.0	256.0	1794.0	7.0
Karnali	Dolpa	967.0	338.0	1696.0	5.0
Karnali	Jumla	3670.0	960.0	6799.0	7.1
Karnali	Mugu	943.0	396.0	2799.0	7.1
Karnali	Humla	518.0	210.0	1468.0	7.0
Sudhur Paschim	Bajura	211.0	100.0	529.0	5.3
Sudhur Paschim	Bajhang	284.0	201.0	997.0	5.0
Sudhur Paschim	Baitadi	215.0	94.0	486.0	5.2

Source: MoALD, 2018/19

Table 6: *Major Pillars of Food Security*

Pillars	Major Causes for Food Insecurity
Availability	• Low agricultural production/productivity • Population growth • Small land holding, feudalism/labor use, misuse of food and dependency on food
Access	• Unequal food distribution, • Lack of road network and market in remote area, • Lack of emergency backup services • Poor purchasing capacity of people and social/geographical disparities
Utilization	• Lack of awareness on nutrition and food habit, high levels of malnutrition, • poor basic services and high disease incidence
Stability	• Stability/Vulnerability to food • Low income, frequent disaster, social conflict, • Poor political and economic governance, • No functioning of traditional/indigenous community food safety net

Source: FAO, 2017

Table 7: *FAO Priorities of Food Security*

Twin Track Approach	Availability	Access & Utilization	Stability
Rural Development/ Productivity Enhancement	Enhancing food supply to the most vulnerable Improving rural food production especially by small-scale farmers Investing in rural infrastructure Investing in rural markets Revitalization of livestock sector Resource rehabilitation and conservation Enhancing income and other entitlements to food	Re-establishing rural institutions Enhancing access to assets Ensuring access to land Reviving rural financial systems Strengthening the labour market Mechanisms to ensure safe food Social rehabilitation programmes	Diversifying agriculture and employment Monitoring food security and vulnerability Dealing with the structural causes of food insecurity Reintegrating refugees and displaced people Developing risk analysis and management Reviving access to credit system and savings mechanisms
Direct & Immediate Access to food	Food Aid Seed/input relief Restocking livestock capital Enabling Market Revival	Transfers: Food/Cash based Asset redistribution Social rehabilitation programmes Nutrition intervention programmes	Re-establishing social safety nets Monitoring immediate vulnerability and intervention impact Peace-building efforts

Source: Pingali, Alinovi & Sutton, 2005

Table 8: *2020 Global Food Security Index*

Rank	Countries	Overall Score	Affordability	Availability	Quality Safety	Natural Resource and Resilience
1	Finland	95.3	90.6	82.0	93.8	73.2
2	Ireland	83.8	92.2	75.7	94.0	73.2
3	Netherlands	79.9	90.7	74.5	88.7	61.5
4	Austria	79.4	89.5	70.8	94.3	61.8
5	Czech Republic	78.6	86.3	70.4	87.1	70.9
6	United Kingdom	78.5	89.7	70.0	92.8	59.4
7	Sweden	78.1	89.2	65.0	92.3	67.4
8	Israel	78.0	89.5	75.3	93.9	46.3
9	Japan	77.9	90.4	73.0	83.4	58.6
10	Switzerland	77.7	87.9	68.4	89.6	64.2
11	United States	77.5	87.8	72.2	94.3	51.4
12	Canada	77.2	85.3	72.0	94.5	54.5

Source: World Economic Forum

Table 9: *Share of Agro Imports in Total Imports*

Year	Total Imports In Rs Billion	Agro Imports In Rs Billion	Percentage of Agro Imports in Total Imports
2009-2010	375.61	44.43	11.8 percent
2010-2011	397.54	54.47	13.7 percent
2011-2012	498.16	76.05	15.3 percent
2012-2013	601.21	99.35	16.5 percent
2013-2014	722.78	127.51	17.6 percent
2014-2015	784.58	137.12	17.4 percent
2015-2016	786.19	134.51	17.10 percent
2016-2017	774.71	136.56	17.62 percent
2017-2018	984.30	138.32	14.06 percent
Total	5925.08	538.93	100.00 percent

Source: Trade and Export Promotion Center [TEPC], 2015; MoF, 2016; 2017

Table 10: *Agro Imports in 2014-2015, 2015-2016, 2016-2017*

S. N.	Particulars	2014-2015 Rs Billion	2015-2016 Rs Billion	2016-2017 Rs billion
1	Cereals	35.12	36.17	37.22
2	Fats and Oil	22.51	23.41	24.81
3	Vegetables	15.93	17.63	18.19
4	Fruits and Nuts	10.54	12.74	12.94
5	Animal Fodder	10.02	11.92	12.02
6	Oil Seeds	9.11	9.81	10.11
7	Coffee, Tea, Species	4.27	5.17	4.57
8	Sugar, Confectionary	3.49	4.41	3.89
9	Beverages	2.92	3.12	3.12
10	Tobacco	2.55	2.75	2.95
11	Live Animal	2.42	2.62	2.92
12	Dairy Products	2.15	2.95	3.15
13	Fish	1.15	1.65	1.85
Total		122.18	134.35	137.74

Source: TEPC, 2015; 2016; 2017

Table 11: *Status of Food Security: Global and Local Scenario*

S.N.	Name of Country	Global Food Security Index	Rank
1	Switzerland	79.0	1
2	Ireland	78.9	2
3	Austria	78.0	3
4	USA	77.5	8
5	China	47	47
6	India	77	77
7	Nepal	82	82

Source: Economic Intelligent Unit, 2018

Food Security Status in Federal Nepal			
Province	percent of Food Secure HHs	percent of Mildly Food Insecure HHs	percent of Severely Food Insecure HHs
1	50	20	9
2	44	28	11
Bagmati	55	15	8
Gandaki	56	16	6
5	48	20	10
Karnali	22	18	18
Sudurpaschim	38	18	12

Source: NLSS, 2016

Appendix E: Glimpses of the Field Study