DETERMINANTS OF THE FOOD SECURITY OF SMALL HOLDER FARMERS IN NEPAL

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DETERMINANTS OF THE FOOD SECURITY OF SMALLHOLDER FARMERS IN NEPAL BINAYA KAFLE 2018

DECLARATION

I hereby declare that the thesis entitled**Determinants of the Food Security of Smallholder Farmers in Nepal** submitted to the Central Department of Rural Development, Tribhuvan University, is entirely my original work prepared under the guidance and supervision of my supervisor. I have made due acknowledgements to all ideas and information borrowed from different sources in the course of preparing this thesis. The results of this thesis have not been presented or submitted anywhere else for the award of any degree or for any other purposes.

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BinayaKafle

Date: January 7, 2018

2074/09/23

RECOMMENDATION LETTER

The thesis entitled **Determinants of the Food Security of Smallholder Farmers in Nepal**has been prepared by **BinayaKafle** under my supervision.I hereby recommend this thesis for the examination by the thesis committee as a partialfulfillment of the requirements for the Degree ofMaster of Arts in Rural Development.

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APPROVAL LETTER

The thesis entitled **Determinants of the Food Security of Smallholder Farmers in Nepal**submitted by **BinayaKafle** to the Central Department of Rural Development, Faculty of Humanities and Social Science, Tribhuvan University, in partial fulfillment of requirements for the Degree of Arts in Rural Development has been found satisfactory in scope and quality. Therefore, we accept this thesis as a part of the degree.

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ABSTRACT

This study has investigated the determinants of the food security of smallholder farmers in Nepal. Ithas used the data from the Annual Household Survey 2014/15, National Sample Census of Agriculture 2011/12 both published by the Central Bureau of Statistics and the Household Budget Survey 2014/15published by the Nepal Rastra Bank to collect socioeconomic and demographic characteristics of the smallholder farmers in Nepal.

After the descriptive analysis of the data it was put into probit regression model due to the dichotomous nature of the dependent variable to estimate the likelihood of the household being food poor. The model was fitted with 7 independent variables that were identified by previous researchers affecting thefood insecurity of smallholder farmer's household.

The probit regression results showed that household socioeconomic and demographic characteristics;household size, gender and age of household head, household income,urban region of household and agricultural land holding had significant impact on the fate of household being food poor at 95% level of confidence. Household size, male head, and age of household head were positively associated with food insecurity of the smallholder farmers' household. The household income, agriculture land holding, and urban households had negative association with the likelihood of the households being food poor. Thus established relationship of food insecurity of smallholder farmer household with socioeconomic and demographic factors would help in determining whether the household is likely to be food poor or not.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

AHS	Annual Household Survey
CBS	Central Bureau of Statistics
DDS	Dietary Diversity Score
FAO	Food and Agriculture Organization
FCS	Food Consumption Score
Ha	hectare
HBS	Household Budget Survey
HH	Household
Kg	kilogram
MoAD	Ministry of Agricultural Development
Mt	Metric ton
NDHS	Nepal Demographic and Health Survey
NGO	Non Governmental Organization
NLSS	Nepal Living Standard Survey
NSCA	National Sample Census of Agriculture
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
Rs	Rupees
U.S.	United States
WFP	World Food Program
WFS	World Food Summit

CHAPTER ONE

INTRODUCTION

1.1 Background

This section introduces about the importance of food security on the households and food security status of Nepal. It further clarifies about the objective, problem statement, importance and limitations of the study.

Food security is a condition whereby all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996). This is the globally accepted definition of food security which was approved by 186 countries in the World Food Summit (WFS) held in 1996.

The condition of being food secure is connected with the possibility of being protected from abject poverty, being healthy, along with the freedom to grab available opportunities to earn income for living as well as ensure growth in the society.

Country poverty is the root cause for food insecurity, under nutrition, social, education, healthcare and employment deprivations.Low productivity in agriculture is a major contributor to poverty and food insecurity (FAO,2010).

The main reasons for the food security have been categorized into four pillars: Availability, Accessibility, Utilization, Stability/Vulnerability to Food (FAO, 2010).

As per the CBS (2011) a majority of the agricultural households in Nepal depend on small farm size for cultivation. Of the total farmersabout 55 percent are “small” farmers (operating less than 0.5 ha of land) and other 4 percent are “large”farmers (operating 2 ha and more land). There are 2.7 million smallholder farms which make up for 70% of the food produced.Smallholders farmers can be defined as those marginal and sub-marginal farm households that own or/and cultivate less than 2 hectare of land. However this number is significantly low in the developing and least developed countries. In the case of Nepal this number is on an average 0.52 hectare(FAO, 2015).

Nepal with the population of 26.4 million and total households (HHs) of 54,23,297 consists of about 25.2 percent population living under poverty line (CBS, 2011). In the fiscal year 2014/15 the per capita consumption of Nepalese households on food was Rs. 33,090 (US$ 343.8).The proportion of householdswith inadequate food consumption (a score below or equal to 42 FCS) was 15.5 percent (CBS, 2016).

In this condition the livelihood would be more troublesome for the smallholder farmers and their households due to limited resources. The consequences of food insecurity are that poor have already exhausted their saving to buy food, sold the property and increased school dropout which have significant impact in their growth and well being.

The problem of food insecurity can be overcome by intervening in all the four pillars of causes of food insecurity. The short term focus might include school based program, livelihood strengthening, disaster preparedness, establish and maintain food reserves and the long term focus might be strengthening agriculture development programs, improving agriculture marketing, controlling food losses, policy development, land use planning, etc. Achieving food security is far less costly than dealing with the consequences of not meeting this need.And, it is impossible to bring about improvement in the food security without first knowing the status of the food insecurity and different factors affecting the same.

Thus the scope of this research is to examine the impacts of socioeconomic and demographic factors on the food security of small holder farmers of Nepal.

1.2 Problem Statement

Food insecurity and hunger remain pervasive in Nepal, not only in food deficit districts but also within marginalized communities in districts with surplus food production.Agricultural smallholders are one of the groups most vulnerable to food insecurity. Typically, smallholder households in rain-fed agricultural systems rely upon the agricultural production to store enough food for the family and to purchase household necessities over the non-cultivable season. They are more sensitive to price shocks and variation. Subsequently, many smallholder farmers suffer from periodic food insecurity near the time of plantingand shortly after crops are in the ground, as these are the points in time when food stocks are lowest fromthe previous season’s harvest. Smallholder agricultural households must carefully balance productive and reproductive decisions to maintain a minimum level of consumption throughout the course of the year (Barrett, 2002).

There are a total of 54.9 percent of smallholder farmers in Nepal (NSCA, 2011/12) who have significant impact on the annual agriculture production and feeding capacity of the whole nation. Sustainable management of smallholder production systems is a key food security and environmental concern.

But the food security status of the smallholder farmers' households is scarcely found. Despite being at the forefront of the risk of food insecurity their status is unknown. It is imperative to know the factors affecting their food insecurity to produce significant improvement in their status. The food security status could have multiplier effect in their overall development as fulfillment of basic need is one of the core values of rural development. Thus the study is about determining how the socioeconomic and demographic factors affect the likelihood of the household of smallholder farmer being food insecure.

1.3 Objectives of the Study

The general objective is to assess the impact of socio-economic and demographic factors on the food security of smallholder farmers in Nepal.

The specific objectives of the research are:

- To analyzedemographic factors affecting smallholder farmer's household food security.
- To analyze the socioeconomic factors of smallholder farmer's household food security.
- To examine to what extent food security is impacted by these factors.

1.4Significance of the Study

This study would provide policy makers with information regarding condition of food security of the smallholder farmers, factors affecting their condition, and assist them in adopting effective programs respective to these factors to limit the problems of food insecurity.Additionally such kind of research will be an important source of knowledge for the academicians, development actors and agencies.

1.5Limitations of the Study

Being based on secondary sources for data, the inherent errors are carried onto this research as well. Only 7 factors of socio-economic and demographic characters affecting food insecurity have been considered in this research. The sample for this study has been taken as 403 smallholder farmers' households. The statistical inference has been made using the Annual Household Survey 2014/15, Household Budget Survey 2016, and National Sample Census of Agriculture 2011/12 despite the comparison of three separate surveys is not statistically ideal.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews the previous studies related to the scope of this study which have been categorized into theoretical review, empirical review and conceptual review.

2.1 Theoretical Review

2.1.1 Development as Freedom

Sen (1999) argued, under the theory of 'development as freedom' that the economic development of a community entailed a set of following linked freedoms:

- Freedom of opportunity, including freedom to access credit,
- Political freedoms and transparency in relations between people, and
- Economic protection from poverty.

The three core values of rural development include:

- Ability to meet basic needs; food, clothes, shelter, security, education, health services, etc.
- Self-esteem, and
- Freedom from servitude i.e. able to choose

And the rural development is linked to infrastructural development, food security, commercialization of agriculture, proper utilization and mobilization of resources, creating opportunities, inclusive social development in the rural community and modernization of overall society (Acharya, 2008). The condition of being food secure is connected with the possibility of being protected from abject poverty, being healthy, along with the freedom to grab available opportunities to earn income for living as well as ensure growth in the society. As observed in the core values, food is one of the components for the development, the research subject i.e. food security of smallholder farmers of Nepal is directly linked with the theory of rural development and is a matter to be studied.

2.1.2 World Systems Theory

The core of economic dependency or world systems theory is the argument that international trade and investment impose negative social effects. The effects might include; multi-national companies repatriating profits and discourage domestic

investment, being based on advanced technology absorb less domestic labors, are mostly concentrated in export industries with weak market ties, and oppose social programs that benefit the lower class.There is the long term decline in the international trade for primary versus processed goods. The notion of food security through trade promoted by suprastate organizations like the United Nations Food and Agriculture Organization, the World Bank, and the World Trade Organization has created this unwritten rule of the neoliberal food regime. The food dependency has been stronger on basic foods in developing countries, while advanced capitalist countries' dependency has been mostly on luxury foods. Also, the more those developing countries become dependent on food imports and exports, the more they will be importing the world food price for the relevant commodities. Food-price inflation will more adversely affect their working classes, which spend larger shares of their household budgets on food. Mihalache-O'keef and Li (2011) has disaggregated FDI into sector-specific inflows and found that manufacturing FDI improves food insecurity while primary sector FDI, including agriculture, may reduce food security.

2.1.3 Modernization Theory

It emphasizes on the internal sources of economic development. The argument is that domestic investment and educational growth create industrialization and cultural modernization, which in turn contribute to economic growth, societal integration, and stronger institutions for providing social welfare. Investment in human capital via increase education creates a labor force with modern motivation, greater skills, social mobility, and adaptability to modern technology. This increases food supply, infant survival, and adult longevity which might promote food security.Globalization and food security are intimately linked in the modernization perspective, especially in regards to economic integration. It is suggested that the re-situation of production will have a positive effect on both national and human development through productivity gains and positive spillover effects within developing countries (Gilpin, 1987).

2.2 Empirical Studies

2.2.1 Status of Food Security in Nepal

Nepal with the population of 26.4 million and total households (HHs) of 54,23,297 consists of about 25.2 percent population living under poverty line (CBS, 2011). Nepal Multiple Indicator Cluster Survey 2014 has reported that 37.4 percent of the Nepali

children under five years were too short or stunted and 11.3 percent were too thin or wasted reflecting the extent of chronic and acute under nutrition respectively (CBS, 2015).

According to the Annual Household Survey 2014/15, 20.9 percent of the Nepal's population was living below poverty line and 47 percent of children under 5 were suffering from stunting. The US Global Hunger and Food Security Initiative says that two out of every three Nepalese suffer from food insecurity at some time during the year (CBS, 2016).

The above data shows that even-though the poverty is decreasing through 2011 to 2014/15, the condition of malnutrition has been exacerbated which is evident from the increment in percentages of stunted and wasted children. This trend suggests the incidence of food insecurity in Nepal.

As per the CBS (2011) a majority of the agricultural households depend on small farm size for cultivation. Of the total farmersabout 53 percent are “small” farmers (operating less than 0.5 ha of land) and other 4 percent are “large”farmers (operating 2 ha and more land).

From the following table it is found that food insecurity is gradually increasing in Nepal after 1991. Though, we see it was food secured in 1991 but after that, we can see the fluctuation on the food production and requirement with surplus from 1999 to 2004 and again surplus from 2010/11 to 2014/15 back to food deficit in 2015/16. In theyear 1994/95 the food deficit was about 12.49 percent, and in the year of 2006/07 it was 3.60 percent.However, if we see the trend of food surplus/deficit, we can observe the fluctuating status. The following table presents the trend food self-sufficiency situation since 1990 to 2015/16.

Table 2.1 Food self sufficiency: historical trend of Nepal

Year	Production (000Mt)	Requirement (000Mt)	Deficit	
			'000Mt	As % of requirement
1990/91	3619	3487	+132	+3.78
1991/92	3373	3562	-189	-5.31
1992/93	3292	3634	-342	-9.41
1993/94	3585	3724	-139	-3.73
1994/95	3398	3883	-485	-12.49
1995/96	3917	3948	-31	-0.79
1996/97	3973	4079	-106	-2.60
1997/98	4027	4178	-151	-3.61
1998/99	4098	4279	-181	-4.23
1999/2000	4452	4383	+69	+1.57
2000/01	4513	4430	+83	+1.87
2001/02	4543	4463	+80	+1.79
2002/03	4641	4565	+75	+1.64
2003/04	4884	4671	+213	+4.56
2004/05	4942	4780	+163	+3.41
2005/06	4869	4891	-21	-0.43
2006/07	4815	4995	-180	-3.60
2007/08	5195	5173	+22	+0.42
2008/09	7979	8111	-132	-1.63
2009/10	7378	7760	-382	-4.92
2010/11	8946	8612	+334	+3.87
2011/12	10399	9456	+943	+9.97
2012/13	8986	8578	+408	+4.76
2013/14	10089	9300	+789	+8.48
2014/15	-	-	+155	-
2015/16	-	-	-71	-

Source: FAO: SPPD Report and MoAD

The above table only depicts the status of food availability in the country in the respective fiscal years. The data about the accessibility, utilization, and stability is not provided which limits the status of country's food security.

Nepalese households in 2014/15 spend on average Rs. 2,92,312 (US$ 3037.2) in a year for goods and servicesof which more than half (56.9%) goes for food.On food, the per capita consumption is Rs. 33,090 (US$ 343.8). The proportion of householdswith inadequate food consumption (a score below or equal to 42 FCS) is 15.5 percent. The urban households have access to more diverse foods than the rural households. Almost10.5 percent of households have poor dietary diversity, characterized by consumption of 4 orless food groups in the past 7 days (CBS, 2016).

Nationally, 47 % of the land owning HHs owned only 15 % of the land with an average size of less than 0.5 ha, whereas the top 5 % owned nearly 37 % of land. A rough estimate by WFP stated that the minimum amount of land required for HHs self-sufficiency is approximately 0.54 ha (OCHA, 2008).

According to CBS (2011), out of the total households in the country, 74 percent are agricultural households with land and roughly 2 percent are agricultural households without land. Households operating agricultural land areconcentrated in the hills and the tarai. Out of total households operating land, 58 percent arein the hills, 43 percent in the tarai and only 9 percent are in the mountains.The average size of agricultural land area in the country is 0.7 hectares. As one would expect, averagesize of agriculture land-area is higher in rural areas (0.7 hectare) compared with urban areas (0.5hectare).

When the average agricultural land is considered with the average provided by OCHA, the HHs of the nationseems to have the minimum amount of land required for self-sufficiency. Despite this fact, food insecurity is still a chronic problem of the nation. In the fiscal year 2015/16, the MoAD had designated 36 districts of the country as food deficit, meaning their output being unable to feed the population.

2.2.2 Smallholder Households

Smallholder households are typically characterized as small producers who retain at least some of their agricultural production for consumption within the household. From a food security perspective, the consumption of agricultural products is thus likely to be more similar amongst members of smallholder households(Sadoulet and Janvry, 1995).

Smallholders households can be defined as those marginal and sub-marginal farmhouseholds that own or/and cultivate less than 2 hectare of land. However this

number is significantly low in the case of developing and least developed countries. In Nepal this number is on an average 0.52 hectare but 2.7 million smallholder farms make up for 70% of the food produced in Nepal(FAO, 2015).

2.2.3 Food Security – Household Perspective

Food security is "a condition whereby all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996).

Food security is commonly identified as a microeconomic problem subject to conditions of risk and uncertainty. For the analysis of food security, the two most common levels of analysis are the individual and household.Food insecurity is defined as lack of access by members of society and nations to enough food throughout the year to live healthily. This is a situation caused either by inadequate food availability i.e. lack of adequate supply or by inadequate entitlements i.e. lack of effective demand, or both (Khadka, 1991).

The original household model was developed by Becker in 1965. It sets forth the smallholder household problem as one of maximizing utility subject to a household profit function, preferences for consumption of agricultural and non-agricultural goods, and preferences for work or leisure.

According to Hopkins (1986) food security stands as a fundamental need, basic to all human needs and the organization of social life. Access to necessary nutrients is fundamental, not only to life per se, but also to stable and enduring social order.

2.2.4 Policy of Food Security

The constitution of Nepal 2015 has mentioned food access as a fundamental human right of all citizens in the article 36 c.According to international law, every human being has rights to be freed from hunger andrights to have safe and nutritious food. Universal declaration on human rights, Conventionson Child Rights and other international legal documents have ensured the rights of food.Nepal does not have a comprehensive food security policy addressing the differentdimensions of food security; however, food security and nutrition have been included indifferent policy document.

The government policy determines the approach taken to reach the overall or specific goals towards improving the nutrition and food security situation in Nepal. The National

Planning Commission (NPC) and other concerned line ministries form the relevant policies. The compilation of these policies is provided below:

- National Health Policy 1991
- Agriculture Perspective Plan 1995, updated to National Agriculture Policy 2004
- National Nutrition Policy and Strategy 2004
- Agribusiness Promotion Policy 2006
- Agro Biodiversity Policy 2007

Government plans related to nutrition and food security provide a framework for alignment to all concerned stakeholders for their respective planning and action. An array of long term, short term and periodic plans has been developed that are relevant to nutrition and food security. The Multi Sector Nutrition Plan I (2013-2017) and II (2018-2022) developed by NPC with 6 sectoral ministries highlights the commitment to reduce under nutrition in Nepal. Other related plans of food security are as below:

- Food Security and Nutrition Plan
- SunaulaHazar Din 2016

A variety of formal safety net programs exist like, food for work, food for education, food for pregnant and lactating mothers, cash transfers and food subsidies but coverage is limited and confined mostly at the district headquarters, and are far from adequate to feed the requirements of food insecure districts. However, there is no specific, strong, sustainable and notable foodsecurity related safety net targeting to the weaker section of the society to ensure the rightsto food.

2.2.5 Agencies Working in Food Security and Nutrition

Government agencies, international agencies, and civil society have been implementing various programs related to the food security and nutrition development. Some of the key agencies working in this field are:

- Ministry of Agricultural Development (MoAD)
- Ministry of Federal Affairs and Local Development (MoFALD)
- Nepal Food Corporation (NFC)
- World Food Program (WFP)
- Agro Enterprise Center (AEC)
- International agencies: DFID, GTZ, UNICEF, FAO, etc.

2.2.6 Previous Studies

Kinsey (1994) found that there is a significant relationshipbetween household food security and household socioeconomic and demographic characteristics,such as, annual income, household size, education, whether the household is headed by a singleparent, employment status, presence of savings, and home ownership, specifically strong relationship with regardto the issue of gender and food security. Women's contributions to the household play an important role in food security both interms of production and nutrition.

A study by Kyaw (2009) of Myanmar's rice deficit region presentsthe characteristics and determinants of food insecurity status in rural farm and non-farm ruralhouseholds. This study identifies several potential determinants of food security including humancapital, food production, household income, asset ownership, and income diversification (farmand non-farm income).

Maxwell (1995) had indicated that various indicators can be used to identify food insecurity status based on the specificity of concerned area. In the case of subsistence production system in the remote hills, the indicators to be considered could be access to land and livestock resources, demographic resources, household size, age of household age, cultivating land holding, dependency ratio, total income, economically active female household member, etc (Ojha, 1999).

Asghar and Muhammad (2013) investigated the determinants of food insecurity for both general and farmer household in Pakistan and reported the probability of the same being food insecure or secure using logit model. The household size, household size square, household income, number of rooms,dependency ratio, electricity connection, irrigation facility, age and age square of householdhead were found to be significant determinants of food insecurity. Household size, education of household head, annual income and agricultural income were someof the most important factors influencing the household's food insecurity status.

Wangthamrong (2010) conducted study in Thailand to determine the probability of a household being food poor due to social, economic and demographic characteristics. The probit regression result of the study showed the householdsize, male head of household, income earning members, total household income, education,household agricultural land, and household total assets were all highly significantpredictors of food poverty.

The networks for agricultural production and food acquisition produced apositive impact on food security on a study conducted by Lamb (2011) on the impacts of social networks on food security of smallholder farmers in Kenya and Uganda.

According to Newman (1992) the proportion of households in food poverty is on the decline, and renewed international efforts to end food deprivation for children are under way. We are still a long way from a third threshold of a full but healthy diet with the choices available in industrialized nations. Projecting world food demand, under alternative assumptions of both diet and population growth, indicates that nearly three times the present level of food production might be required for an improved diet and almost five times for a full, but healthy, diet, some 60 years from now. He concludes that the global production of food needs to expand threefold over the next sixty years, and particularly in regions bypassed by the green revolution.

Leathers and Foster (1999) have analyzed the causes behind food insecurity in the World and have found that poverty, income inequalities, population growth and illness continue to be important causes of under nutrition. They have found economic, demographic, environmental catastrophe, political system, agronomic and health as the main causes of food insecurity.

Ghimire and Dahal (2004) on the other hand have analyzed food security through import export basis. An increase in trade in food and agriculture products does have economic implications that are relevant to food security. Increased export would mean better incomes, which may enhance affordability of food products that are available in the market. The study reveals that Nepal's traditional food items are rich in micronutrients. They may, however, lose to the attractive looking and ready-to-eat food packages imported from elsewhere even if they may not have the same nutritional value as many homegrown products.

Seddon and Adhikari (2003) have analyzed the cause and effect relationship between conflict and food security. According the study the current conflict has had an additional adverse impact on the local food economy, by creating a climate of insecurity which has both reduced market imports and exports of food and restricted government and NGO food distribution. From late 2001 onwards, the conflict, which by then affected most parts of Nepal, has had a range of effects on lives and livelihoods, system of food distribution and markets, production and consumption, development processes, service provision and the implementation of development programmes at all levels. The authors have estimated

that there are perhaps as many as 5 million people whose lives and livelihoods have been affected in some ways over the entire period of the people's war.

Koirala and Thapa (1997) have attempted to assess the challenges of food security in Nepal and have tried to identify suitable strategies for attaining sustainable food security. The study has analyzed the food security situation of Nepal from a historical perspective and found Nepal's poor position in the world context in terms of food imports and exports. Food production in Nepal is subdued by the closing agricultural land frontier, lack of desired growth in agricultural productivity, and unfavorable trade balance for the import of food. The study has found variation in agro-climatic conditions, illiteracy, Skill or competence and low budget allocation for research as the major challenges.

Shiva and Bedi (2002) have analyzed how the globalization has affected the food security system. The study found that the core element of globalization- liberalization, privatization and Structural Adjustment Program (SAP) have an adverse impact on household food stock and food distribution systems. According to them globalization destroys the possibility of growing food that can be grown locally because of the subsidies that hide the real costs of production and distribution.

Adhikari (2008) has analyzed food security situation of Kathmandu valley from historical perspective. He has analyzed the data since 1975 to the till date. He has revealed the food production and consumption pattern and food supply (export and import) condition in the past and present. He concludes that with the adoption of economic liberalization policies since the 1980s, the market has directly and adversely affected each family's food security. Statistics also indicate that food prices have skyrocketed, especially in the 1990s when the government has implemented the liberalization in economy as a part of Structural Adjustment Program. At present, Kathmandu is dependent mainly on India for the supply of not only rice, but also other commodities like pulses, fruit and vegetable.

WFS (2005) found that in the two years on the world food situation, three fundamental factors have not changed. First, the world's population continues to rise and will most likely reach 9 billion in the next generation. Second, small farmers dominate agriculture in the developing world and are likely to continue to do so. Third, poverty remains the root cause of hunger and malnutrition. Although urbanization is increasing, the poor still live predominantly in rural areas and inequality between haves and have-nots is rising.

According to the ministry of Agriculture and Cooperative 133000 metric ton food is insufficient due to marginal land and land slide in national level. According to the Agricultural census 2001/002, the food production of the country is only sufficient for 40 percent of families. Similarly 26 percent of population has sufficient food for 4-6 months with their own production and 13 percent couldn't support even 1-3 months**.** According to the Ministry of Agriculture, it is estimated that the production has decreased by 30 percent in Humla, 40 percent in Rolpa, 40 percent in Salyan and 50 percent in Jajarkot. Furthermore, WFP claims that 7 lakhs people are in food crisis in Mid and Far Western region due to the drought (WFP, 2005).

A full scale analytical study by FAO (2003) has found that continuing high population growth, slow growing agricultural output, lack of adequate livelihood opportunities, shortage of nutritious food, high levels of poverty, lack of health care facilities, lack of education and public awareness have translated into a host of nutritional problems. However the study has raised some questions towards the Agriculture Perspective Plan (APP) (1997-2017) implementation, which was regarded as a milestone in the agricultural transformation. The implementation of APP has fallen far short of requirements, co-ordination has been poor, investment has been far short of targets and many of the important institutional reforms demanded by the plan are still –at best- in the pipeline.

Shrestha (2000) has done a study on intra-household resource dynamics and rural householdfood security through gender perspective and has found that 50 percent of HH of the study area reported food sufficiency up to only 6 months.

Magar (2003) has also done a study on food security situation in Nepal which is based on secondary information and shows that there are massive numbers of HHs who are suffering from food inadequacy. Food security measures are not fully success to solve the problem. Population pressure is very high and is in increasing trend. Supply of food grain from the food surplus district is decreasing. He has done the study based on secondary data available in various organizations and also does not reveal any finding of Far Western region.

A research study by IFPRI (2009) found that the food aid requirement is estimated at 1144000 tones, including 1400 tones in the western mountains, 19200 tones in the mid westernmountain, 31000 tones in the Far Western mountains, and 62800 tons in the Far Western hills. With food aid anticipated from the Nepal Food Corporation (NFC) and WFP at 101800 tones, there remains an uncovered deficit of around 12600 tones. The

study further writes lack of economic access to food is the core critical problem in the hill and mountain areas of the Far and Mid Western regions because of very low purchasing power and extremely high market prices.

Agriculture and rural economic growth remains constrained by inadequate infrastructure, weak irrigation and inefficient input and output markets, Nepal's poor road infrastructure –one of the least developed in the world- prevents the development of markets and hence the growth of farm and non farm incomes (WFP, 2006).

Zakari, Ying and Song (2014) had conducted study on the factors influencing household food security in West Africa, Niger. The empirical results from logistic regression revealed that the gender of the head of household, diseases and pests, labor supply, flooding, poverty, access to market, the distance away from the main road and food aid were significant factors influencing the odds ratio of a household having enough daily rations. Another important finding was that female headed households are more vulnerable to food insecurity compared to male headed households.

Mango et al (2014) while examining factors influencing household food security among smallholder farmers in Mudzi district of Zimbabwe, found that household dietary diversity was influenced by the age and education of the household head, household labor and size, livestock ownership, access to market information and remittances. And the linear regression found that labour, education of the household head, household size, remittances, livestock ownership and access to market information all affected household food security.

According to Abu and Soom (2016), income of household head, rural households size, and farm size had positive impact while age of household head and urban household size had a negative relationship with the food security of the farming households of Benue state, Nigeria.

Shah et al (2017) had studied the factors affecting rural household food security in northern area of Pakistan using a binary logistic regression technique. The result revealed that age, gender, education, remittances, unemployment, inflation, assets, and diseases were important factors determining household food security. Moreover, households with female head were food insecure than the male headed household.

From the various literatures it is obvious that food insecurity is the cause of composite factors such as low production, conflict, uneven import-export situation, natural disaster, household demographics and power relations, community organizations, support and aids, etc. Most of the literature related to the food insecurity are concerned to the international

arena and are concerned with the historical trend, causes of food insecurity and government's role in tackling with the food problem.

The literature lacks about the status of the small holder farmers in terms of food security and additionally what factors impact the food security. Thus, my present study is focused to assess impact of factors on the food security of the same group. Thus it is relevant to study the impacts of similar demographic and socio-economic factors on food security of smallholder farmers of Nepal.

2.3Conceptual Framework

Food security at the household level is a function of many factors thatempower individuals to access nutritionally adequate and safe food. Theseinclude a host of socioeconomic, demographic and community-related variables. It is importantto recognize that economic security is an essential precursor to permanent food security.Furthermore, economic security is itself a complex outcome related to steady, adequate income,family stability, affordable expenditures and access to a social safety net in times of need (Iram, 2004).

Global and national food availability stands at the most macro level of the food securityequation. Global food availability is determined by total world food production in relation to theworld's population. In any given year, national food availability is determined by a country'sown food production, its stocks of food, and its net imports of food, including food aid. Studies show that ownership of land is crucial to the food security of rural households,and that the landless tend to be the poorest in rural society. Despite the fact that most food is produced in the countryside, those in towns and cities have thegreatest access to it. This may seem counter-intuitive, but it graphically illustrates the differencebetween food availability and food access (Gill, 2003).

While it is not deniable that food availability is an element to food security, however,more important is the food accessibility of household and individual. The access thata household has to food depends on many factors. Some of the most important factors arepresented below.

2.3.1 Income

The theoretical association between income and household food expenditures has a longand well established history. The Engel curve shows how purchases of food commodities change when money income changes assuming prices, tastes and

preferences, and the number of consumers areconstant,. This relationship is based on Engel's law, which states that the lower the familymoney income the greater the percentage of that income spent for food. The decline in thepercent of income spent on food as incomes rise is rooted in the fact that even though food is anecessity, its consumption is limited by the size of the human stomach. Human beings simplycannot continue to increase their food consumption in proportion to the increase in their income.(Davis, 1982).

Non-agricultural sources of income are important to enhance food security as they increase the household's access to food. The associated jobs like school teachers, government official and other officials are important not only from cash earning point but also to increase individual access to information.

Poverty is the major determinant of household food insecurity. The poor do not have adequate means to secure their access to food. Increasing incomes of households can improve the food security status.

2.3.2 Household Size

There is considerable evidence of a strong negative correlation between household sizeand income per person in developing countries. It is often found that people living in larger andgenerally younger households are typically poorer. Engel curve seeks to explain this byillustrating that across household of different size, the increase in household size will increasehousehold’s food share and decrease income of household. Since increase in food share is anincrease in a proportion of expense, a higher food share indicates lower well-being of households(Deaton& Paxton, 1998).However, the existence of size economies in household consumption cautions againstconcluding that larger families tend to be poorer.

2.3.3 Gender

There has been increased recognition of the crucial importance of women'scontribution to food security. Women in all developing regions play a predominant role inhousehold food security through their involvement in agricultural and food production.

According to FAO (1996), women account for approximately 50 percent of overall regional food production, with considerable variation from country to country. Thereport also shows that the direct responsibility for household food production falls largely

onwomen. The improvement of household food security and nutritional levels are therefore closelyrelated to women's ability to earn income and their roles in household expenditure decisions.

In many societies, women supply most of the labor needed to produce food crops andoften control the use or sale of food produce grown on plots they manage. However, women’scapacity to produce food is reduced by an unequal distribution of assets, such as land, water, andlabor. Women are less likely to own land and usually gain only the rights to use the land which isoften mediated through a male relative (World Bank, 2009).

In addition to their crucial roles in food production, women also contribute to foodsecurity in other significant ways. For example, women are responsible for supplying theirfamilies with food and care. They often have special knowledge of the value and diverse use ofplants for nutrition, health, and income. They also perform the overwhelming majority of thework in food processing in developing countries. This processing reduces food losses, contributeto diversity of diet, and supplies important vitamins and minerals to the individuals in thehousehold.

Moreover, development planners have discovered that the increase of householdincome through the employment of men in cash does not necessarily increase household incomeavailable for the purchase of food. On the other hand, when women have direct control overincome, they tend to spend it on the well-being of the family, particularly on improving thenutritional security of the more vulnerable members (FAO, 1996).

2.3.4 Education

The general education level of the household head has been found to have a substantialimpact on food expenditures. Multiple channels have been identified through which an educatedperson is more likely to be food-secure. As Mukudi (2003) claims, education has a key role inaccessing public information, especially concerning health, nutrition, and hygiene. Acquiringknowledge about how to avoid and face illnesses is essential since people with diseases requiremore calories to be food secure. Education also helps people know that they need to have anadequate and diversified diet in order to build a stronger immune system and avoid morbidityand mortality, and that they must follow good hygienic practices to prevent diseases likediarrhea.

Mass media, such as radios, are wide spread even among poorpeople living in rural areas; therefore, people with only a minimum level of education canproperly access and

understand food related information.This argument can also be extended to the nutritional outcomes of the children. Childrenof less educated parents and those of parents with no education, consistently score poorly onnutritional status indices. Moreover, there is an important gender aspect to ensuring long-termfood security; girls who attend school and obtain at least the basic skills can teach proper health,nutrition and hygienic practices to their children once they become mothers. This implies thatfemale education should play a central part in any program aimed at improving nutritional status.

2.3.5 Age

Household head age is also considered an important factor since the needs and the ways in which an individual thinks are closely related to the number of years a person has lived. According to Hofferth (2003), older people are more mature and may have better experiences in obtaining the types of the resources they require. As well as, older people are supposed to have more agriculture production practices, particularly in the rural settings where the agriculture is the mainstay. On the other hand, there is equal possibility that the older household heads have low tendency of adopting improved technology in agriculture and also economically not much active as compared to younger one. Rose et al. (1998) makes a point about the older people as they are less mobile, which might prevent them to reach at low cost stores etc. Households having household head age less than 35 are found to be the least food insecure for both general and farmer households.

2.3.6 Agricultural Land Holding

Land holding is important factor determining the total household production and consumption. Tschirley and Weber (1994) reported that land area cultivated is the principal determinant of calorie production and has positive or neutral effect of off-farm income and cash crop income on household food security. Ownership of land is crucial to the food security of rural households, and that the landless tend to be the poorest in rural society.

2.3.7 Urban

Households in urban region show the proximity to access the market. People in the city are likely to have better access to markets. In addition, distance from the city can be an obstacle for the poor to enter labor markets, earn income, and buy food (Wangthamrong, 2010).

Figure 2.1Conceptual Framework for thedeterminants of the household's food security

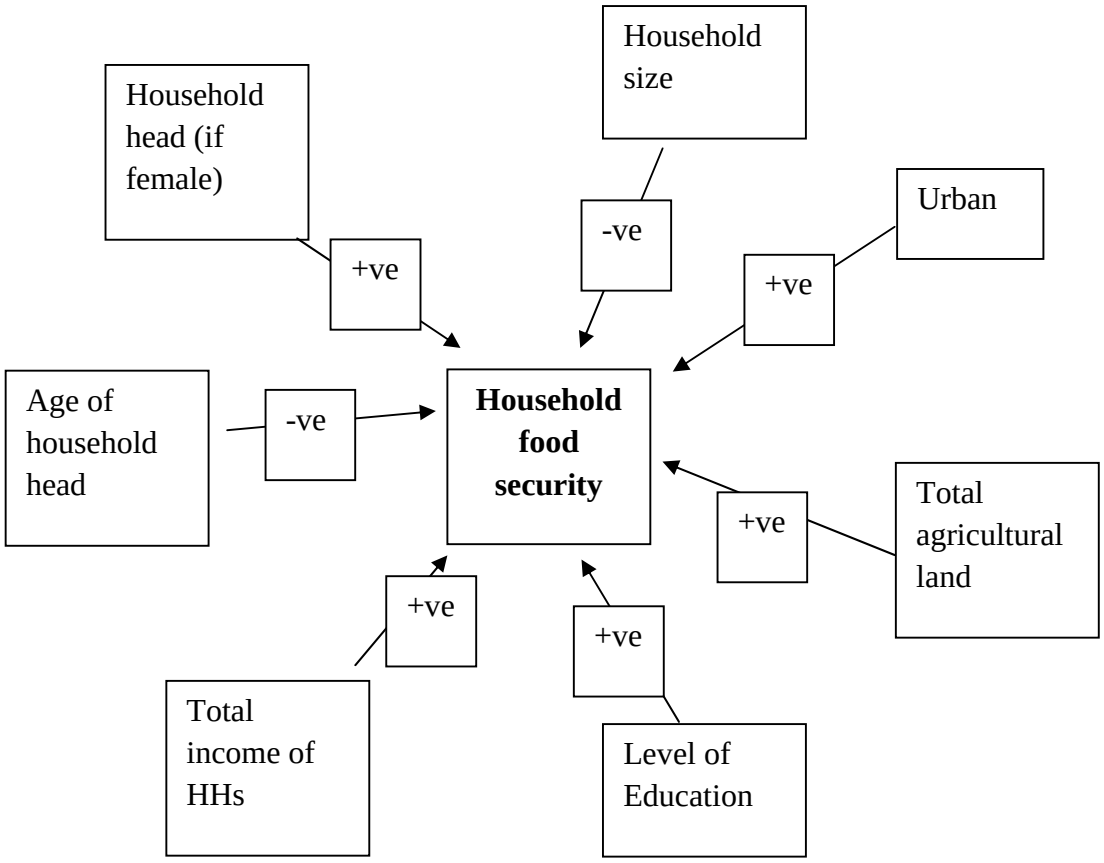


Table 2.2 Factors affecting household food poverty and expected signs

S.N.	Factors	Expected relation to food poverty	Sign	Reference
1	Household size	More members in the family increases the likelihood of being food poor	+	Deaton & Paxton (1998)
2	Household head	Male head increases the likelihood of households being food poor	+	FAO (1996)
3	Age of household head	Old aged head cannot adopt new technology, are less mobile, and are also economically not active so increase likelihood of households being food poor.	+	Rose et al. (1998)
4	Level of education household head	Higher education decreases the likelihood of households being food poor.	_	Mukundi (2003)
5	Total agricultural land holding	More agricultural land result in higher food production which decreases the likelihood of households being food poor	_	Tschirley and Weber (1994)
6	Total household income	More income decreases the likelihood of households being food poor	_	Davis (1982)
7	Urban	Households in urban region decrease the likelihood of households being food poor.	_	Wangthamrong (2010)

Source: Literature review

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The research has used explanatory research design to explain the impacts of the demographic and socioeconomic factors on the food security of the smallholder farmers.

3.2 Nature and Sources of Data

The quantitative data were received from the secondary sources;the Annual Household Survey(AHS) 2014/15, National Sample Census of Agriculture (NSCA) 2011/12 both published by CBS and Household Budget Survey (HBS) 2014/15 published by Nepal Rastra Bank (NRB).

3.3 Study Population and Sample

The universe for this research is the total households of Nepal. And the target population was the smallholder farmers' households, i.e. households with land holdings upto 0.5ha.

The AHS 2014/15 studied a total of 4320 households with 2145 from urban and 2175 from rural spread over 65 districts having equal probability on the basis of two-stage systematic random sampling technique.

The HBS 2014/15 was conducted with 8028 households with 3623 from rural and 4405 from urban region spread over all ecological belts and development regions. A three-stage stratified sampling design was adopted in the survey in which market centers selected from the strata were the first stage units, wards from market centers were the second stage units, and households from wards were the third stage units.

The NSCA 2011/12 conducted the census study on 1,24,144 agricultural land holdings. For this study, the sample size was 403 smallholder farmers' households.

3.4 Data Analysis

The collected data was entered in the Microsoft Excel 2007 and the probit regression was performed using Real Statistics Add-Ins feature. A probit model is a way to perform regression for binary outcome variables. Binary outcome variables are dependent variables with two possibilities, like yes/no, positive test result/negative test result or single/not single. The word “probit” is a combination of the words probability and unit;

the probit model estimates the probability a value will fall into one of the two possible binary (i.e. unit) outcomes (Long, 1997).

This study has considered following variables into consideration; food poverty(dependent variable), householdsize, household head, age of household head, level of education of household head, household agricultural land, household income, and urban as independent variables.

These factors were put into the probit multiple regression model, using maximum likelihood estimation (MLE) methoddue to the dichotomous nature of the data, to investigate the effect of various socioeconomic and demographic factors on household food security. The model uses cross-sectional data at the household level for the estimation as below:

Food Poverty = β0 + β1 Household size + β2 Household Head + β3 Age of Household head + β4 Total Household Income + β5 Level of Education + β6 Household Agricultural Land + β7 Household Total Assets + β8 Urban + u

According to Asghar and Muhammad (2013), the logit model is of the form,

$$ln\left(\frac{\varphi_i}{1-\varphi_i}\right) = \beta_0 + \sum_{j=1}^{n-k} \beta_j x_{ij} + \varepsilon_i$$

where,ψ_i stands for the probability of household being food insecure, $x_{ij}$are the factors determining the food insecurity status forhousehold, β_j stands for the parameter to be estimated.

And, the probabilities for sample households were calculated as,

$$\hat{\varphi}_i = \frac{e^{\left(\hat{\beta}_0 + \sum_{j=1}^{n=k} \hat{\beta}_j x_{ij}\right)}}{1 + e^{\left(\hat{\beta}_0 + \sum_{j=1}^{n=k} \hat{\beta}_j x_{ij}\right)}}$$

Where, *e* is the Euler constant which value is 2.718.

After the calculation of the conditional probabilities for each sample households, the partial effects of the continuous individual variables were calculated as the average of;

$$\hat{\varphi}_i(1-\hat{\varphi}_i)\hat{\beta}_j$$

And, the partial effects of the discrete were obtained by taking the difference of the mean probabilities estimated for their respective categories.

Table 3Definitions of variables used in the analysis

Variables	Description
Dependent variable	
Food Poverty	A dummy variable reflecting a household's monthlyexpenditure on food divided by number ofmembers in household. A value of 1 is assigned if the resultof this calculation is below Rs 994/person/month (CBS, 2011).
Independent variables	
Household size	Number of members of family in household
Household head	A dummy variable reflecting the gender where the value of 1 is assigned to male.
Age of household head	A categorical variable for age of household head is divided into: 1 for 15-24, 2 for 25-59, and 3 for 60-over categories. Each category is treated as dummy variable.
Total household income	Average total monthly income of household in Rupees.
Level of education	Members of household with these levels of education: 1 for illiterate, 2 for read and write only, 3 for primary(upto grade 5), 4 for secondary (6-10 grade), and 5 for tertiary(11-higher). Each category is treated as dummy variable.
Household agricultural land	Area of land used by household in agriculture measured in hectare(ha), 1 for no land (0.0135 ha in Terai and 0.0127 ha in Hills), 2 for less than 0.1ha, 3 for 0.1 to 0.2 ha, 4 for 0.2 to 0.5 ha, 5 for 0.5 to 1 ha, 6 for 1 ha or more.
Urban	A dummy variable where the value of 1 is assigned if the household is in urban area.

CHAPTER FOUR

ANALYSIS AND INTERPRETATION OF DATA

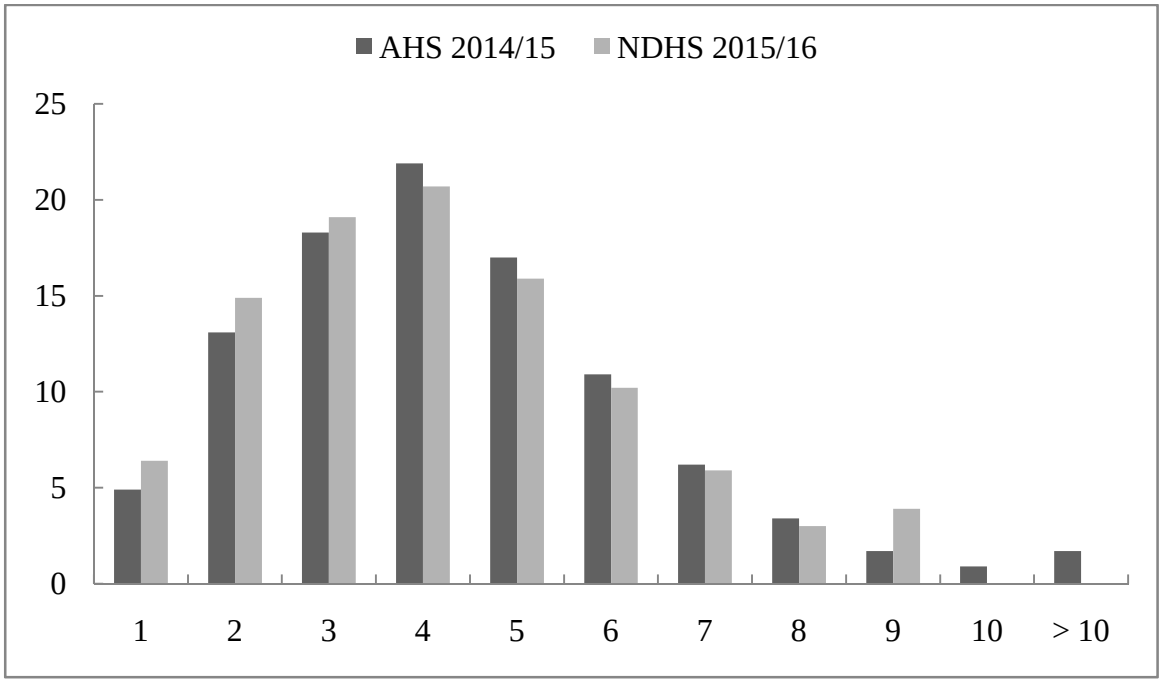
4.1 Demographic and SocioeconomicCharacteristics

The data collected using Annual Household Survey (AHS) 2014/15, Household Budget Survey(HBS) 2014/15, and NationalSampleCensusofAgriculture Nepal (NSCA) 2011-12 has been presented in tables and graphs to present the overview of the demographic and socioeconomic status of the smallholder farmers in Nepal. The AHS had sampled 4320 households, HBS had 8028 households as sample, while NSCA covered 1,24,144 agricultural holdings operated by households only.

4.1.1 Household Size

The average household size of Nepal has been reported as 4.5 by AHS 2014/15, 4.95 by HBS 2014/15, and 4.2 by NDHS 2016. Observing the data of the two years the average household size is decreasing. The overview of percentage distribution of household size has been presented in the following figure.

Figure 4.1 Percentage distribution of household size



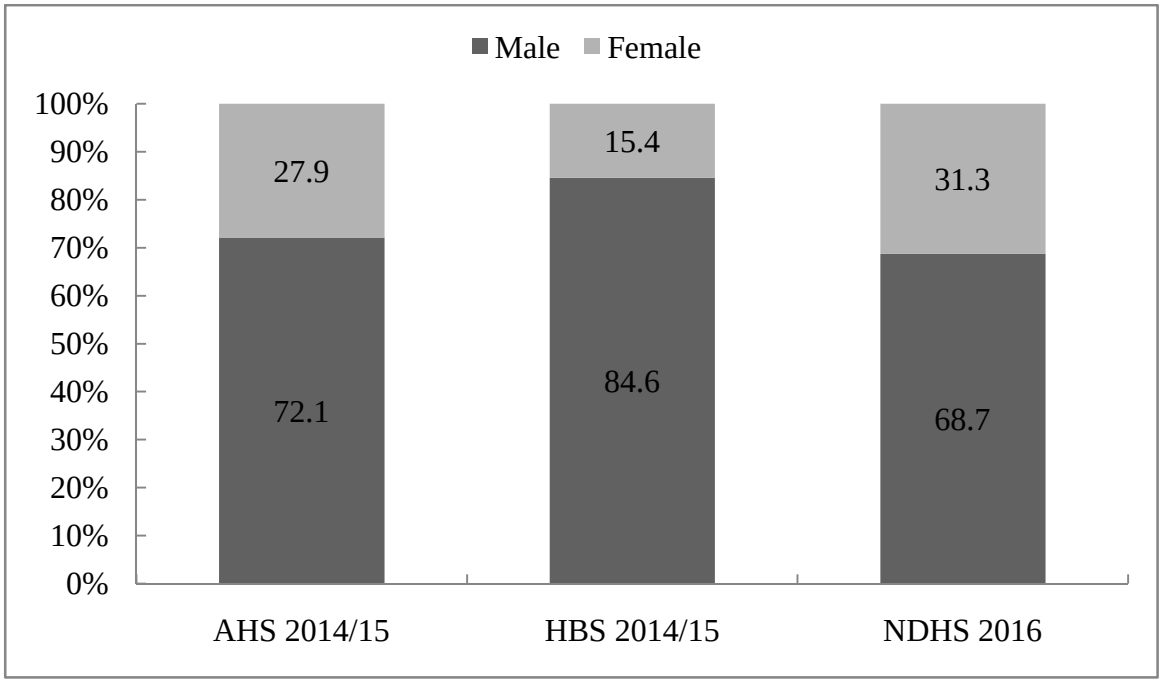
The above bar diagram depicts the percentage of household size with 21.9 and 20.7 percent of the size of 4 members, followed by 18.3 and 19.1 percent of 3 members, and 17 and 15.9 percent of 5 members while mere 3.3 and 3.9 percent of higher than

9members by the AHS 2014/15 and NDHS 2015/16 respectively. Also the percentage of household with only a single member was only 4.9 and 6.4 percent respectively.

4.1.2 Gender of Household Head

The percentage distribution of household head by gender according to the AHS 2014/15, HBS 2014/15, and NDHS 2016 has been presented in the figure below.

Figure 4.2 Percentage distribution of household head by gender

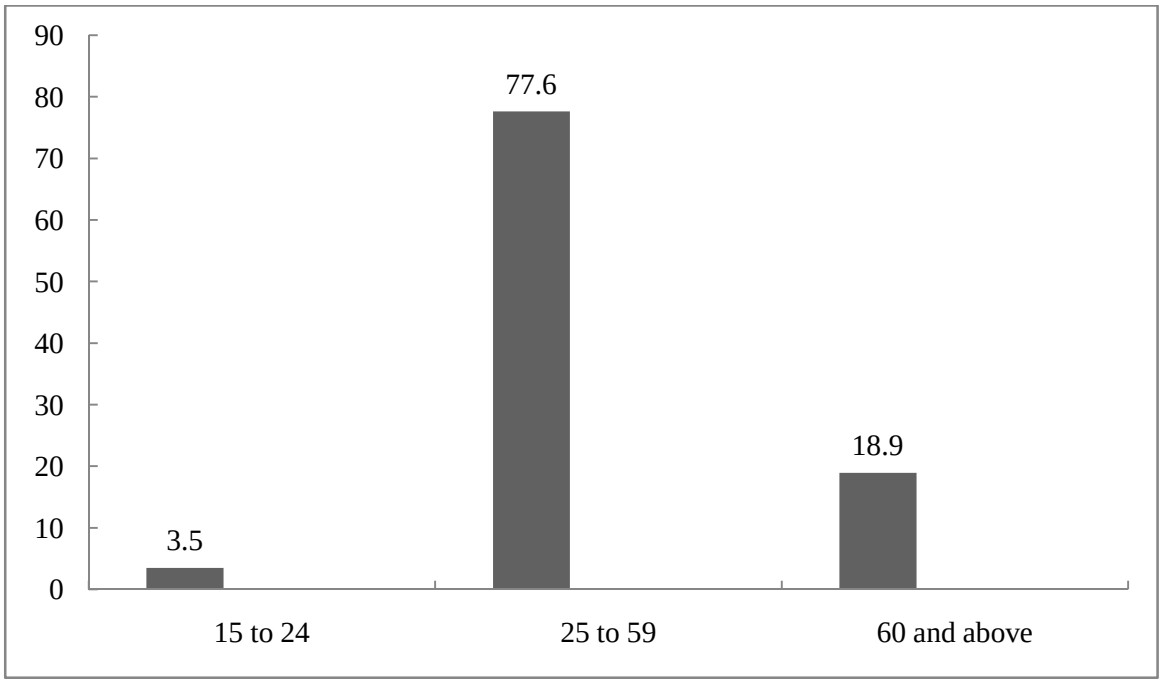


Out of the total households surveyed by the AHS 2014/15, HBS 2014/15, and NDHS 2016, 27.9 percent, 15.4 percent, and 31.3 percent households were headed by female whereas the rest 72.1, 84.6, and 68.7 percent households were headed by male respectively. The decisive power is clearly observed to fall on male but nevertheless the percentage of female headed households is increasing. The difference in the findings of AHS and BHS despite being conducted in the year of 2014/15 might be the difference in the sample size.

4.1.3 Age of Household Head

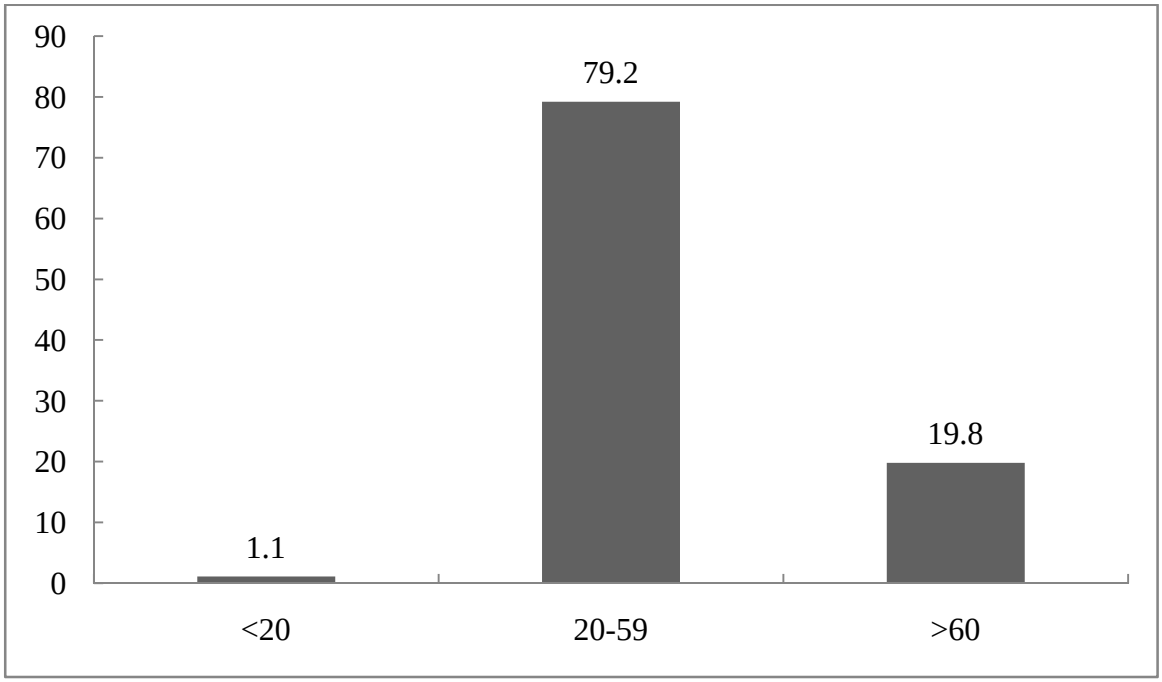
The average age of the household head as reported by HBS 2014/15 was 45.87. The percentage distribution of the household head by age reported by AHS 2014/15 and HBS 2014/15 has been provided in the following figures.

Figure 4.3 Percentage distribution of household head by age by HBS 2014/15



According to the above bar-diagram, 77.6 percent household head were 25 to 59 years of age, 18.9 percent were of 60 or over, and only 3.5 percent were of the age of 15 to 24 years.

Figure 4.4Percentage distribution of household head by age by AHS 2014/15



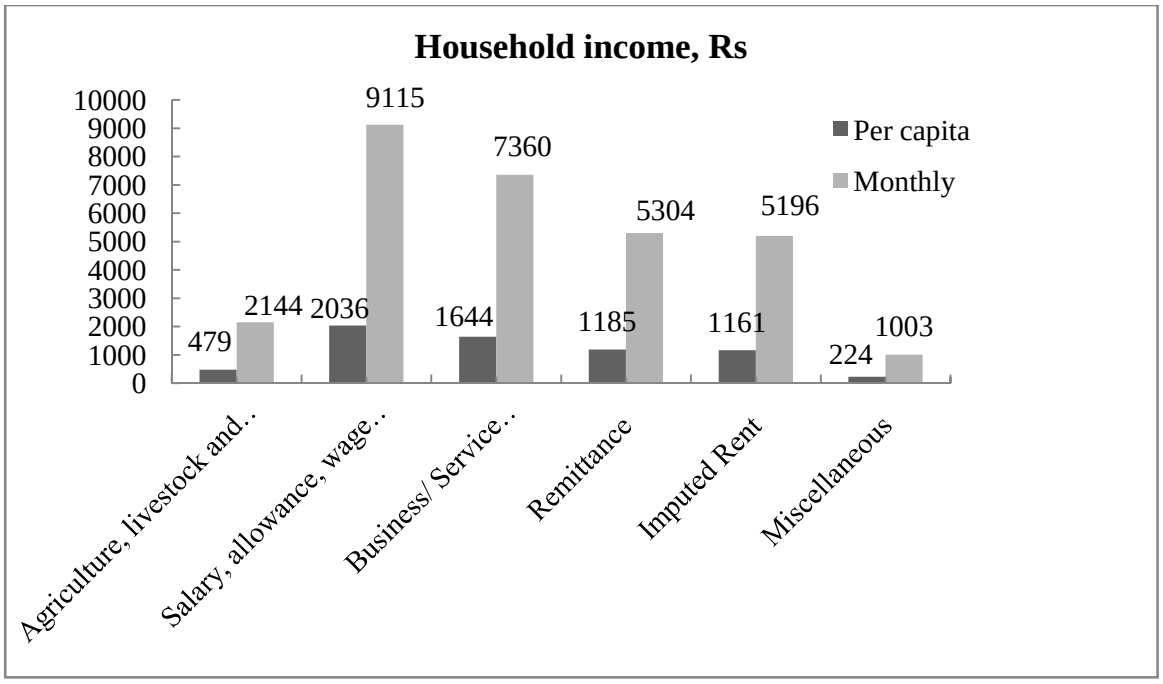
The 79.2 percent of households had head aged 20 to 59 years old, 19.8 percent had 60 years old and above, while that of less than 20 years old was only about 1.1 percent. The

AHS and HBShave produced similar findings. This means the decision regarding family affairs falls in the hands of young generation i.e. age group of 20 to 59 years of age.

4.1.4Total Household Income

The Household Budget Survey 2014/15 has reported the average monthly income of Nepalese households as Rs. 30,121 in the year 2014/15. The source of income was classified as individual salary, wages,allowance and pension amount ofall usual members of thehouseholds, income frombusiness enterprises run by thehousehold members, incomefrom rent, interest and dividend,imputed rent of owner occupiedhouses, transfer income, incomefrom remittance and others. It also included the value of goods and services producedby households for their own consumption.

Figure 4.5 Distribution of household income per month and per capita



The contribution of agriculture, livestock and fishery stood at Rs. 2,144 and the contribution of salary, allowance, wage and pension stood at Rs. 9,115. Similarly, the contribution of business/service, enterprise and other related stood at Rs. 7,360 and the contribution of remittance stood at Rs. 5,304. The contribution of imputed rent stood at Rs. 5,196 and the contribution of miscellaneous stood at Rs. 1,003.

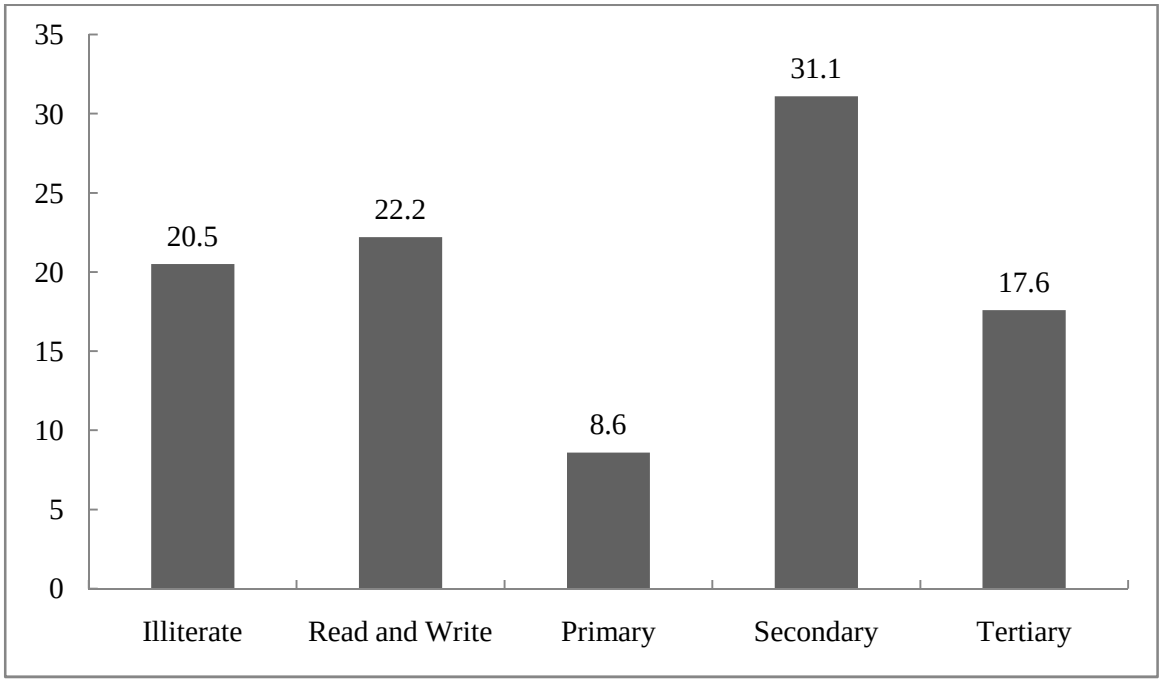
The contribution in per capita monthly income by agriculture, livestock and fishery stood at Rs. 479 and salary, allowance, wage and pension contributed Rs. 2,036. Similarly, the contribution of business/service, enterprise and other related stood at

Rs.1,644 and the contribution of remittance stood at Rs. 1,185. The contribution of imputed rent stood at Rs. 1,161 and the contribution of miscellaneous stood at Rs.224. Thus, the per capita monthly income of the surveyed households stood at Rs. 6,729.

4.1.5 Level of Education of Household Head

The households have been categorized according to the level of education of head as illiterate, read and write, primary, secondary, and tertiary in the Household Budget Survey 2008. The percentage distribution of the households by the level of education of household head is presented in the figure below.

Figure4.6 Percentage distribution of household head by education level

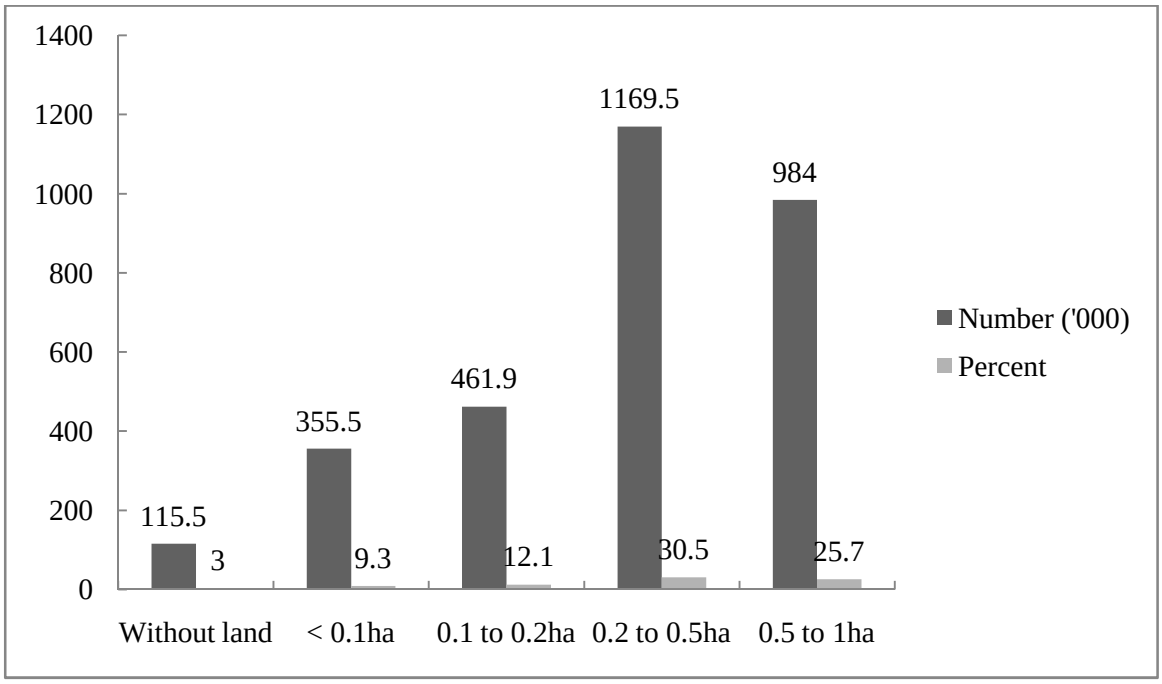


The highest percentage, about 31 percent of the household head had secondary level of education and the lowest, about 9 percent had education up to the primary level. The illiterate were about 20 percent and the household head who could only read and write were about 22 percent. About 18 percent of the household head had the tertiary level of education. This indicates that only 58 percent of the household head had received any type of formal education.

4.1.6 Household Agricultural Land

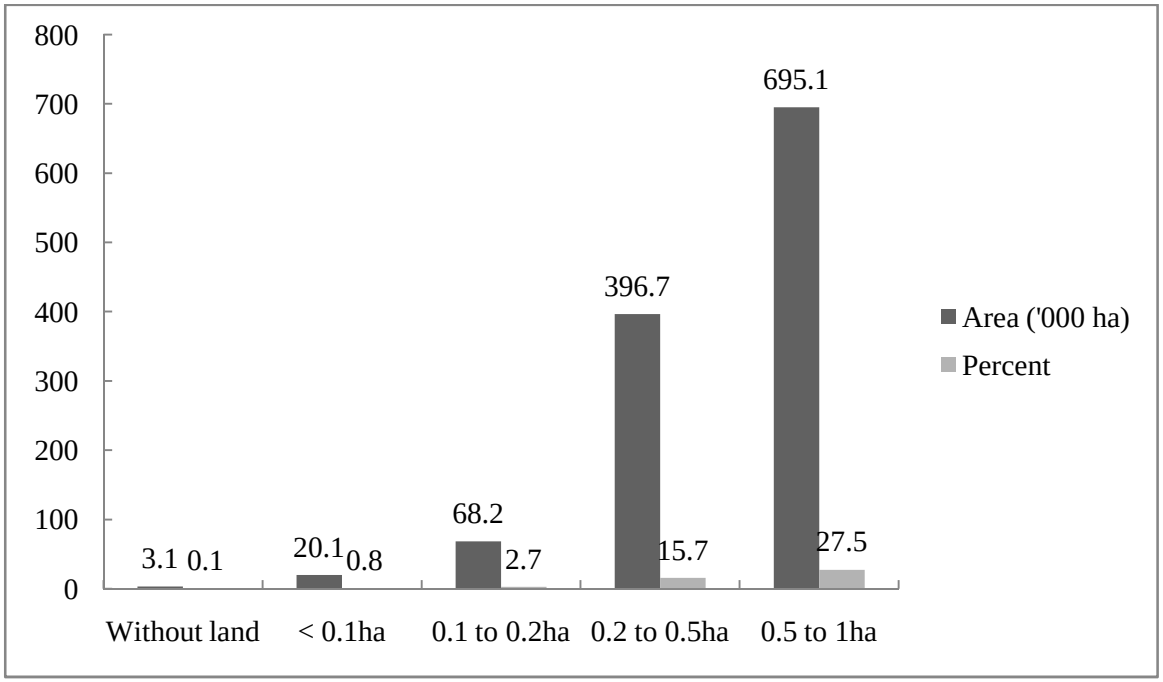
The agricultural land holding of the households by the number and area has been provided in the National Sample Census of Agriculture 2011/12. The percentage distribution of the household by the number and area of holdings is provided in the figures below:

Figure 4.7Percentage distribution of household by no. of agricultural land holding



A total of 54.9 percentages of the famers in Nepal are smallholder farmers (less than 0.5ha land). As shown in the above bar diagram of the number of agriculture land holdings of the smallholder farmers, about 30 percent farmed in 0.2 to 0.5 ha land, 12 percent in 0.1 to 0.2 ha land, 9 percent in less than 0.1 ha land, and 3 percent were without land.

Figure 4.8Percentage distribution of household by area of agricultural land holding



As shown in the above bar diagram of the area of the agriculture land holdings of the smallholder farmers, 0.1 percent was without owner, 0.8 percent was less than 0.1 ha, 2.7 percent was 0.1 to 0.2 ha, 15.7 percent was 0.2 to 0.5 ha, and 27.5 percent was 0.5 to 1 ha.

4.1.7 Agriculture Land Holding by Age and Sex

Similar to the age and sex of household head, this statistic is important for farm activities as well. The NSCA 2011/12 provides the information on the same as the following table:

Table 4.1Agriculture land holding by age and sex

Agriculture land	15-24 years		25 to 64 years		65 years and above	
	Male	Female	Male	Female	Male	Female
Without land	2842	1033	82273	20037	7852	1500
< 0.1 ha	9281	7229	209881	94695	26679	7783
0.1 to 0.2 ha	14105	8157	293598	101629	34852	9616
0.2 to 0.5 ha	29216	13261	786840	223613	98415	18158

The above table shows, out of the 54.9 percent of smallholder farmers of Nepal, 75.9 percent are male and remaining 24.1 percent are female. Similar to the household decision making, the affairs regarding agriculture also falls on male.

Out of these, 4 percent belong to age group of 15 to 24 years, 86.2 percent belong to 25 to 64 years, and 9.7 percent belong to 65 and over. Similar to the household head, the decisions regarding agriculture is also taken by holders of age 25 to 64 years.

Among these 65.1 percent are male and 34.9 percent femaleof age 15-24 years, 75.7 percent are male and 24.3 are female of age group 25 to 64 years, and 81.9 percent are male and 18.1 percent female of age group 65 years and above. In each of the age-groups, the number of male is significantly higherthan the female.

4.1.8 Education Level of Agriculture Land Holder

The education level of the small farm holder impacts on the effective farm activities which increases the likelihood of higher food production and income. The NSCA 2011/12 provides the information on the same as the following table:

Table 4.2 Education level of agriculture land holder

Agriculture land	Read and write		Primary		Secondary		Tertiary		Illiterate	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Without land	16818	5027	10136	1685	16556	4103	3372	249	46087	11506
< 0.1 ha	53284	26626	31954	12177	64364	24910	19264	4291	76974	41705
0.1 to 0.2 ha	79189	32177	51690	12045	77853	20123	15857	1990	117957	53067
0.2 to 0.5 ha	227554	71971	132128	23577	220653	41374	37174	3992	296962	114118

Source: NSCA, 2011/12

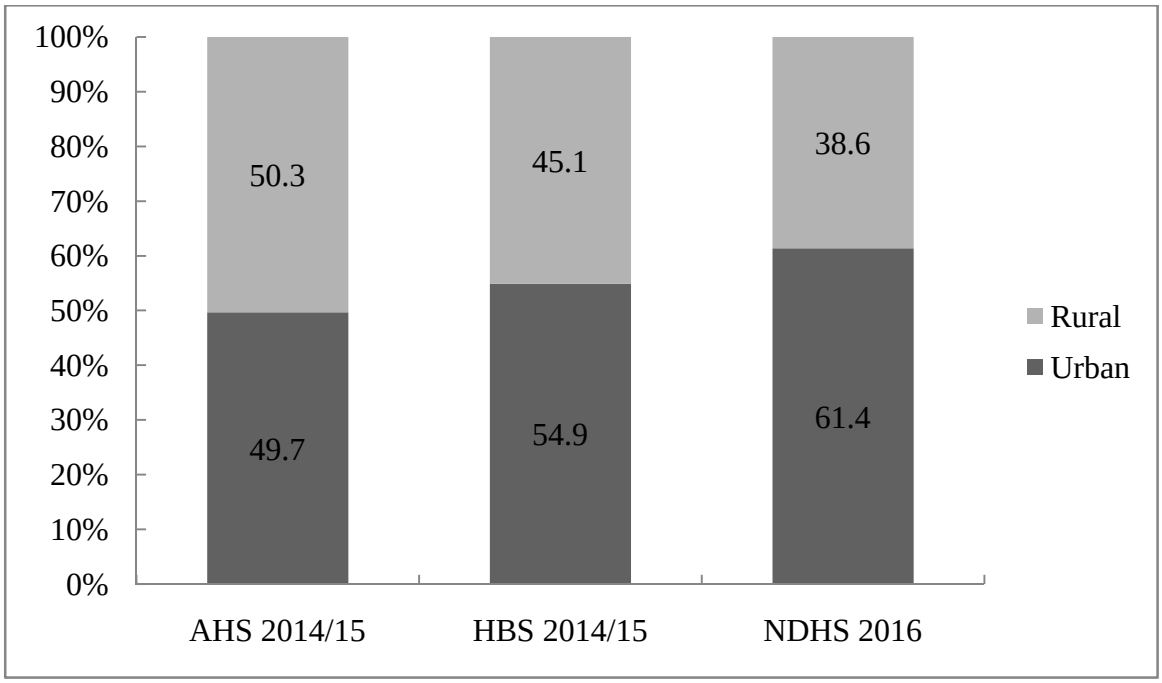
From the above table it is concluded that 63.9 percent of the smallholder farmers are literate while 36.1 percent are illiterate. The illiterate comprised of 70.9 percent male and 29.1 percent female. Likewise the literate comprised of 78.7 percent male and remaining 21.3 percent female.

Among the literate ones, 38.1 percent could read and write only, 20.5 percent had primary level of education, 35 percent had secondary, and 6.4 percent had tertiary level of education. Those who could read and write only comprise 73.5 percent male and 26.5 percent female, educated up-to primary level comprise 82 percent male and 18 percent female, educated up-to secondary level comprise 80.7 percent male and 19.3 percent female, and up-to tertiary level comprise 87.8 percent male and remaining 12.2 percent female.

4.1.9 Urban

The region of households was categorized into rural and urban according to the VDC and municipality category in the AHS 2014/15 and HBS 2014/15 both. With the state restructuring of the rural municipality and municipality, NDHS 2016 has adopted new structure. The percentage distribution of the household by region is provided below:

Figure 4.9 Percentage distribution of the household by rural-urban region



The households are about half in number in both urban and rural regions due to purposive sampling procedure adopted by the AHS 2014/15 and HBS 2014/15 in order to collect representative data of the nation. However due to state restructuring and declaration on new municipalities, the number of households in urban region has increased in NDHS 2016.

4.1.10 Household Food Poverty

The AHS 2014/15 mostly focused only on the access dimension of household food security through adequacy of food consumption and diversity of diet consumed measured as the Food Consumption Score (FCS) and Dietary Diversity Score (DDS) respectively. The mean FCS of Nepal was 66.5, and the percent of households with in-adequate food consumption was 15.5. The mean DDS of Nepal was 6.4, and the households with poor dietary diversity was 10.5 percent.

According to the NDHS 2016, almost half of the households in Nepal are food secure (48%) and have access to food year round. The quantity is similar to that of NDHS 2011 (49%) over the period of five years. Considering the population growth it can be concluded that food security is improving in the nation. However, a large proportion of households in Province 6 (42%) and the lowest wealth quintile (39%) fall in the moderately food insecure category, similarly, the highest proportions of severely food insecure households are in the lowest wealth quintile (22%) and Province 6 (18%).

According to CBS (2011), the poverty line of Nepal was categorized into food and non-food sectors; house, clothes, and education. The total makes up for Rs 19,261 per capita/annum among which Rs 11,929 is for food sector while Rs 7,332 for non-food sector. In this manner the food poverty line makes up Rs 994 per capita/month for Nepal according to the prevalent price index. The research found out that about 25 percent of Nepal's population lived below the national poverty line. The urban sector had 15 percent population and rural had 27 percent population living under the national poverty line.

4.2 Regression Analysis

For Nepal, the result show that household size, gender of household head, age of household head, agricultural land holding, household income and urban are statistically significant at 95% confidence level. This significance suggests that these socio-economic and demographic characteristics play an important role in determining the probability of a household of small farm holders living in food poverty. While the education level of the household head wasnot a significant predictor of the household food insecurity. However, it was negatively correlated with probability of household being food poor.

The positive sign shows that the likelihood of a smallholder farmer's household being food poor increases while the negative sign indicates decreased likelihood of being food poor.

The result from the probit regression provided in the Appendix A is presented in the table below:

Table 4.3Probit regression: Nepal-determinants of household food poverty

Variables	Coefficient (Standard Error)	Partial Effects
Household size (X1)	0.649* (0.097)	2' size 0.1501 3' size 0.1249 4' size 0.1218 5' size 0.1101 6' size 0.0398 7' size 0.0163 8' size 0.7981 9 or more' size 0.330
Gender of household head (X2)	1.425* (0.613)	0.0749
Age of household head (X3)	0.816* (0.253)	25-59' years 0.05465 60 and more years 0.4781
Education level of household head (X4)	-0.072 (0.123)	Literate 0.3711 Read & Write 0.1775 Primary 0.6407 Tertiary 0.7217
Household income (X5)	-0.00007* (0.000013)	0.00000534
Agricultural land holding (X6)	-0.576* (0.095)	Less than 0.1ha 0.0739 0.1 to 0.2ha 0.1474 0.2 to 0.5ha 0.1002
Urban (X7)	-1.275* (0.463)	0.3145
Observations	403	
Constant	-3.361 (1.026)	
Chi square	281.61	

* Significant at 5% level of significance

Agricultural land holding, household income,and urban nature have negative signs. While household size, gender, and age of household head have positive signs. The determinants with negative sign decreases the likelihood of food poverty and determinants with positive sign increases it. More lands for agriculture, higher income and residing in urban region decreased the likelihood of food insecurity. And large number of family members, family with male heads, aged household head increased the food insecurity.

Thus the regression equation can be represented as,

$$Y = u + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7$$

$$Y = (-3.361) + 0.0648*X_1 + 1.425*X_2 + 0.816*X_3 + (-0.00007)*X_5 + (-0.576)*X_6 + (-1.275)*X_7 \quad \text{..... (Eq}^{n}\text{ ii).}$$

And, the probability of the household being food poor is given by,

$= e^{Y}/(1 + e^{Y})$.

The partial effects of the individual variables have been presented in the table 4.3. Increment of one unit of household member increases the likelihood of the household being food poor by 15%, change in household head to male increases the likelihood by 7.5%. Similarly, if the household head is of the age 60 years or more that increases the likelihood of the household being food poor by 47.8%, change to literate only decreases the likelihood by 37.1%, education of tertiary level decreases the likelihood by 72.2%. And household with agricultural land of less than 0.1ha decreases the probability by 7.4%, while land of 0.1 to 0.2 ha decreased by 14%. And if the household is in urban region that decreases the probability by 34.1%.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

Food insecurity is a chronic problem of Nepal. Since the year of 1991/92 there have been periodic cases of food insecurity as evident from the table 2.1. In the fiscal year 2015/16, the MoAD had designated 36 districts of the country as food deficit, meaning their output being unable to feed the population. There are a total of 54.9 percent of smallholder farmers; agricultural land upto 0.52ha, in Nepal (NSCA, 2011/12). Smallholder farmers suffer from periodic food insecurity near the time of plantingand shortly after crops are in the ground, as food stocks are lowest at this point (Barret, 2002). This study has attempted to analyze the socioeconomic and demographic factors affecting the likelihood of the smallholder farmer's household being food insecure.

This study has used the data from the AHS 2014/15, NSCA 2011/12 both published by the CBS and the HBS 2014/15published by the NRBto study how the probability of a household being food-pooris affected by the socio-economic and demographic factors.

After the descriptive analysis of the data it was put into probit regression model due to the dichotomous nature of the dependent variable. The model was fitted with 7 variables that were identified by previous researchers affecting food insecurity.

The probit regression results showed that household socioeconomic and demographic characteristics;household size, gender and age of household head, household income, urban region and agricultural land holding had significant impact on the fate of household being food poor. Large household size,male and aged head of the household along with households in rural regions increased the likelihood to be food poor. While the total household income, and the agricultural land holding decreased the likelihood of a smallholder famer's household being food poor. The probit regression equation obtained after fitting into the model was:

$$Y = (-3.361) + 0.0648*X_1 + 1.425*X_2 + 0.816*X_3 + (-0.00007)*X_5 + (-0.576)*X_6 + (-1.275)*X_7.$$

Thus obtained regression equation would help in determining whether a smallholder farmer's household is likely to be food poor or not.

The partial effects of the individual variables have been presented in the table 4.3. Increment of one unit of household member increased the likelihood of the household being food poor by 15%, change in household head to male increased the likelihood by 7.5%. Similarly, if the household head was of the age 60 years or more that increased the likelihood of the household being food poor by 47.8%. And household with agricultural land of less than 0.1ha decreased the probability by 7.4%, while land of 0.1 to 0.2 ha decreased by 14%. And if the household was in urban region that decreased the probability by 34.1%.

The major finding of this research was that smallholder farmer household's socioeconomic and demographic characteristics played a major role in determining the likelihood of whether or not the household might have tolive in food poverty in Nepal. This study showed that household size, gender and age of household head,household income, urban region of household, and household agricultural land holding significantly affected a smallholder farmer's household's ability to access food. While more agricultural land holding and raising household income decreased the probability of food poverty,a larger household size raised that probability. These findings support the theory that ashousehold size increases, the proportion of income spent on food also rises. Members of thelarger family have more dependents to take care of. This negative effect, however, could bereduced if the proportions of income earning members in the household increases as more members are added.

Households having low income arehighly food insecure as they are left with very small amount to meet their dietary needs aftersparing money for other needs.

5.2 Conclusion

Based on the objectives of the research undertaken, following conclusions are drawn:

- Household size has significant positive relationship, female household head, young aged (25-59 years) household head, and urban household have significant negative association with the food poverty of the smallholder farmers' household at 95% confidence level.
- Household's income and agricultural land holding have negative significant relationship with the food poverty of the smallholder farmer's household.
- The probit regression equation showing relationship of food insecurity with socioeconomic and demographic factors is obtained as follow:

$$Y = (-3.361) + 0.0648*X_1 + 1.425*X_2 + 0.816*X_3 + (-0.00007)*X_5 + (-0.576)*X_6 + (-1.275)*X_7$$

5.3 Recommendations

While the results of this study are useful in identifying the factors that are mostimportant in predicting which households are most at risk of food poverty, further research at theintra-family level is needed. Since food security for a household does not guarantee that allmembers have sufficient access to food, intra-household food consumption should be furtherinvestigated to determine how individual and household characteristics affect the distribution offood within the household.

Further studies should be conducted in the area of foodinsecurity by considering detail and accurate information on various variables including political,climatic and weather (rainfall and temperature), topology, natural disasters, ecological conditionsand other factors that affect food insecurity.It is also recommended to conduct a study that compares status of food insecurity among differentprovinces of Nepal.

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APPENDIX

Appendix A. Demographic and socioeconomic tables

Table 1 Percentage distribution of household size

Household Size	Frequency	AHS 2014/15	HBS 2014/15	2015/16 NDHS
1	212	4.9		6.4
2	564	13.1	7.6	14.9
3	789	18.3		19.1
4	947	21.9	41.6	20.7
5	734	17.0		15.9
6	471	10.9	33.3	10.2
7	267	6.2		5.9
8	149	3.4	11.3	3.0
9	73	1.7		3.9
10	40	0.9		
Higher than 10	74	1.7	6.2	
Total household		4,320	8,028	11,040
	Mean	4.5	4.95	4.2

Table 2 Percentage distribution of household head

Gender	Households	AHS 2014/15	HBS 2014/15	NDHS 2016
Male	3115	72.1	84.6	68.7
Female	1205	27.9	15.4	31.3
Total	4320	100		

Table 3 Percentage distribution of household head by age

Age	Households	HBS 2014/15	AHS 2014/15	
15 to 24	281	3.5	< 20	1.1
25 to 59	6230	77.6	20-59	79.2
60+	1517	18.9	>60	19.8
Total		8028	4320	

Table 4 Percentage distribution of household head by education

Education level	Household	Percentage
Illiterate	1044	20.5
Read and Write	1131	22.2
Primary	438	8.6
Secondary	1585	31.1
Tertiary	897	17.6
Total	5095	

Table 5 Household income distribution by source

Category	Monthly income	Per capita income, Rs	Percentages
Agriculture, livestock and fisheries	2144	479	7.1
Salary, allowance, wage and pension	9115	2036	30.3
Business/ Service enterprise & other related	7360	1644	24.4
Remittance	5304	1185	17.6
Imputed Rent	5196	1161	17.2
Miscellaneous	1003	224	3.4
Total	30121	6729	100

Table 6Percentage distribution of household by the number and area of agricultural land holdings

Size of holding	Holdings		Area of holding	
	number ('000)	Percent	Area ('000 ha)	Percent
Without land	115.5	3.0	3.1	0.1
under 0.1 ha	355.5	9.3	20.1	0.8
0.1 to 0.2 ha	461.9	12.1	68.2	2.7
0.2 to 0.5 ha	1169.5	30.5	396.7	15.7
0.5 ha to 1 ha	984.0	25.7	695.1	27.5
1 ha to 5 ha	732.7	19.1	1258.1	49.9
5 ha to 10 ha	10.7	0.3	69.2	2.7
10 ha and over	1.1	0.03	15.2	0.6
Total	3831.1	100	2525.6	100

Table 7 Percentage distribution of household by rural/urban region

Category	Households	AHS 2014/15	HBS 2014/15	NDHS 2016
Urban	2145	49.7	54.9	61.4
Rural	2175	50.3	45.1	38.6
Total		4320	8028	11040

Appendix B Summary of probit regression

	coeff b	*s.e.*	*Wald*	*p-value*	*lower*	*upper*
Intercept	-3.36131	1.025706	10.7392	0.001049	-5.37166	-1.35097
HH size	0.648605	0.097162	44.56201	2.46E-11	0.45817	0.839039
Gender	1.425295	0.613298	5.400915	0.020126	0.223254	2.627337
Age	0.81643	0.253279	10.39059	0.001267	0.320013	1.312848
Education Level	-0.07213	0.122848	0.344736	0.557108	-0.31291	0.168649
Agricultural Land	-0.57594	0.095041	36.72277	1.36E-09	-0.76222	-0.38966
Urban	-1.27464	0.46322	7.571827	0.005929	-2.18254	-0.36675
Income	-6.9E-05	1.33E-05	26.9655	2.07E-07	-9.5E-05	-4.3E-05

R-Sq (L)	0.672714
R-Sq (CS)	0.512601
R-Sq (N)	0.780911

Chi-Sq	281.61
Df	7
p-value	5.09E-57
alpha	0.05
Sig	Yes

Classification Table

	Suc-Obs	Fail-Obs	
Suc-Pred	73	8	81
Fail-Pred	17	304	321
	90	312	402
Accuracy	0.811111	0.974359	0.937811
Cutoff	0.5		