1 INTRODUCTION

1.1 Background Information

Nepal is a landlocked Mountainous country surrounded by the two emerging economic giants of the world; China in the North and India in three sides. It has diverse topography ranging from lowland plains in the south with elevation as low as 70 meters to the Himalayan mountain range in the North as high as 8,848 meters (WFP, 2009).

Administratively, Nepal is divided into five development regions from east to west (Eastern, Central, Western, Mid-Western, and Far-Western Development Regions) and 75 districts (Fig 1). In district, there are village development committees (VDCs) and municipalities forming lower tiers of administration having access to grassroots directly. The climatic condition, major landforms, soil types, natural vegetation, and production potential vary a lot even within the region due to sudden change in altitude thus, can also be termed as the "land of striking contrast". As a result, many different types of microclimatic pocket areas exist within the same area located in particular agro-ecological region.

Nepal harbors ethnically diverse population of approximately 27 million people with 86 % rural population (WFP, 2009; CBS, 2008a). The country has more than 103 ethnic groups (CBS, 2001) with 92 spoken languages.

Agriculture is the mainstay of the livelihood for the majority of its population, 65.6 percent of total population is involved in agriculture (MOAC, 2007). The national economy is largely agriculture based (WFP, 2009). Despite huge dependency in agriculture, out of 2.5 million hectares, only around 17 percent of the total land area is suitable for agriculture (FAO/WFP, 2007). Agriculture contributed 32.15 percent of the country's Gross Domestic Product (GDP) in the year 2005/06. This has declined overtime from 52 percent in 1985 to 31.3 percent, estimated in 2006/07 (CBS, 2008a).

Despite the predominantly subsistence nature of the agriculture, around 61 percent of the farmers are not self-sufficient in meeting their food needs (CBS, 2003). Also 42 districts out of 75 districts are suffering food deficit situation. Thus, Nepal is categorized as a food insecure, and food deficit country with the national undernourishment rate of 40.7 percent (FAO/WFP, 2007).

Altitude in the Mountain ranges from 4,877m amsl to 8,848m amsl with a very rugged terrain and harsh climate. This region has only 4.22 percent of its land area suitable

for cultivation of agricultural crops (Maharjan, 2003). The Hill region is centrally located between the Mountain and the Terai with altitude ranging from 610m amsl to 4,877m amsl. It comprises steeply sloped land. The region constitutes the largest part of the total area (42 percent of total country's area) providing home to 44.3 percent of total population. This region has been designated as the potential area for high value cash crops including fruits, medicinal herbs, vegetable seeds and several others (APROSC/JMA, 1995). The Terai is the plain area of the country with the altitudinal variation from 70m amsl to 610m amsl. It constitutes 23 percent of the country's total area but the region has the highest share of country's population i.e. 48.4 percent. The Terai accounts 53 percent of gross cropped area, 50 percent land area under food crops, and 66.9 percent land area under cash crops for the year 2002/2003 (CBS, 2004a).
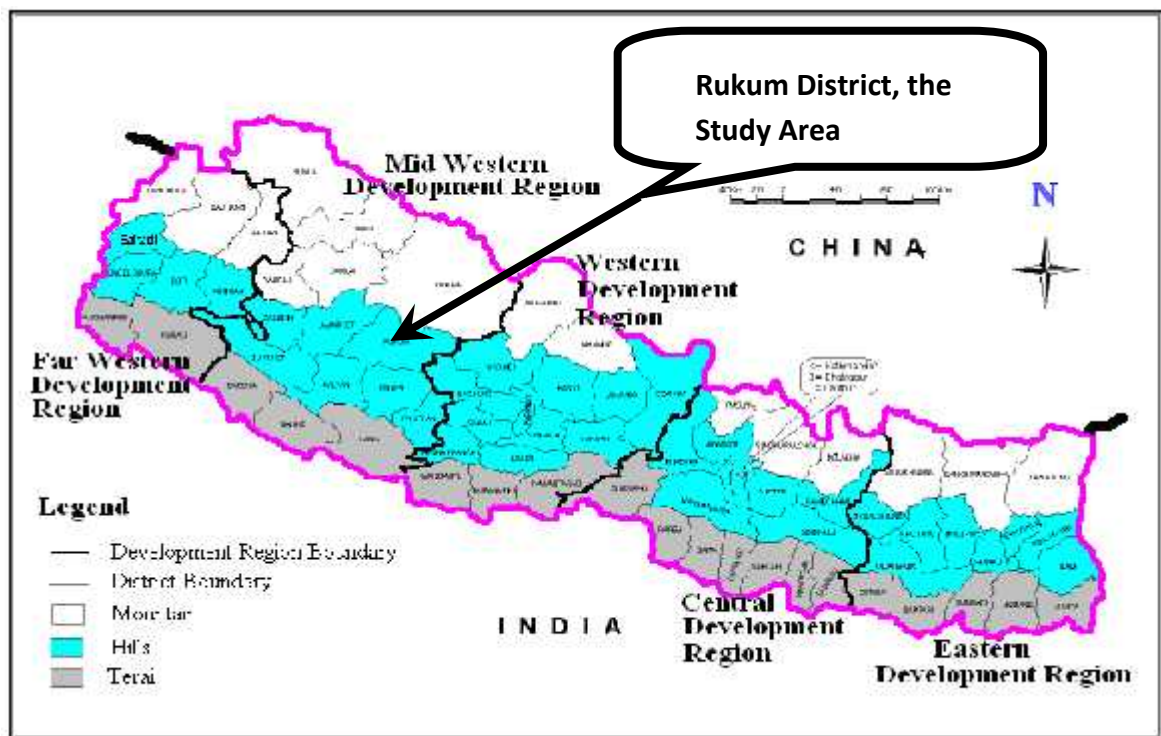

Figure 1.1 Map of Nepal showing three geographical regions (Terai, Hills and Mountains), and administrative divisions (5 Development Regions and 75 Districts)

Source cited: Joshi, 2008

Nepal lacks basic infrastructures as road and transportation, health posts and hospitals, electricity, irrigation, post office and telecommunication, agricultural and livestock service centers, market centers and hatt bazzars, banks and financial institutions (ADB/DFID/ILO, 2009, CBS 2004b).

Nepal's irrigated area (33.4 percent) and about 83 percent of irrigated land is not irrigated year-round, significantly reducing productivity by not allowing multiple crops in a year (ADB/DFID/ILO, 2009). Similarly the market facilities are also limited. According to the NLSS, only 34 percent households have access to nearby market centers within 30 minutes travel but for hat-bazzar, the figure increase to 61 percent, much better than the accessibility of market centers. The similar is the condition of getting financial, educational, health, and agriculture and livestock services from nearby service centers (CBS, 2004b). A report of ADB depicted the adequacy of domestic savings, the efficiency of domestic financial intermediation, and the stock of human capital, but found them to be less critical as the possible constrains for investment and development of national infrastructures. Industries and manufacturing sectors are in coma stage due to the political instability and economic fluctuation (ADB/DFID/ILO, 2009).

1.2 Statement of the problem

Agriculture, the mainstay of life for the majority of the population, is still subsistence in nature and vastly lags behind in modernization with efficient production practice. Hence, despite this huge dependency in agriculture, 61 percent of farmers are not self- sufficient in meeting their food needs (CBS, 2003). The situation is more severe in the Hills and Mountains; 11 out of 16 districts in the Mountain, and 20 out of 39 districts in the Hill are suffering from the food deficit situation with limited market access (FAO/WFP, 2007). The incidence of undernourishment as measured by the insufficient calorie intake is estimated at 40.7 percent in the country, with the consideration of minimum calorie intake requirement of 2,124 kilocalories (kcal) per person per day set by the NPC (FAO/WFP, 2007). The Mid-Western Rural Region has the lowest mean dietary energy consumption (2250 kcal per person per day) compared to 2,405 kcal per person per day of national level. Consequently, this led to the highest incidence of undernourishment with around 50 percent of the population being undernourished in the region. There is also serious concern for the very high level of malnutrition in Nepal. It is more serious in the Mid-Western Mountains and Hills, where more than 60 percent of the children are stunted and 50 percent are underweight in contrast to the Terai region where only 17.7 percent of children under five suffer acute malnutrition on average (FAO/WFP, 2007).

The Rukum District, a hilly district of Mid Western Region of Nepal, is highly vulnerable in terms of food security. The higher dependence in agriculture for livelihood but the declining nature of agricultural production, limited alternatives and opportunities

for income generation, the summer drought have created food deficit situation. The prolonged food deficit in turn converts the acute food insecurity to permanent food insecure stage. This conversion is promoted by the scarce and non hygienic water and foodstuffs consumption and the eruption of epidemic diarrhea in the rainy season taken place. The epidemics cause substantial damage to the livelihood and the food security condition go beyond the severely food insecure stage. People have no food to eat but have to wait one more season to harvest rainy season crop. That aggravated the vulnerability of food insecurity further to the humanitarian emergency in Rukum.

The assessment of the socioeconomic and behavioural drivers of the food security is imperative to understand the facts behind the incidence of food insecurity, its depth and severity in Rukum. Besides, most of the studies were concentrated in the peripheral areas of urban centers ignoring the regions where the issues of food security are more rampant and critical. In addition, there is lack of analysis of food security at the household level in literatures related to Nepal. Therefore this research has been organized with following research questions and is the attempt to find out answers of them.

⟩ What are the major socio-economic and behavioural variables of food security?
⟩ How food security has been affected by different socio-economic and behavioural variables?

1.3 Research Rational

The government of Nepal, through successive 5-year plans, has undertaken various programs to increase agricultural production and reduce poverty that would consequently address the problem of food insecurity (Baidhya, 2004). However, failure of the government to meet the target of agriculture growth and poverty reduction in most of the plan periods has raised serious concern of food security in the country. Although commitments have been made by the government in several international forums regarding food security, including the World Food Summit in 1996 to reduce the number of chronically undernourished people by half by the year 2015 (FAO, 2002), absence of regular monitoring resulted into dearth of information on food security. In most of the literatures, especially in the government documents, food security is assessed in terms of adequacy of the aggregate supply to fulfill the requirement of total population (Sheddon and Adhikari, 2003) regardless of distribution issues based on regional and the socioeconomic differentiation of households. This implies the lack of understanding of the

Food security issues on the part of the policy makers and planners (Baidhya, 2004).

High dependence on agriculture, declining growth of agriculture and other production sectors due to land degradation in contrast to high population growth, limited opportunities for income generation, and social discriminatory factors have been identified as the factors responsible for failure of poverty reduction programs. That directly or indirectly affects the livelihood and earning capacity of such rural communities (Joshi and Maharjan, 2007; CBS, 2005a; CBS, 2005b; UNDP, 2004; SAAPE, 2003; WFP, 2001; Blaikie, Cameron, and Seddon, 2000; Adhikari and Bohle, 1999). Indeed these factors affect the level of household food security but there lacks the study to determine which of the above factors are more critical than the other. However, most of the studies were concentrated in the peripheral areas of urban centers where the researcher can easily accumulate the data and materials for analysis but the complexity of the food security is hardly explored. In addition, the household food security issue is always masked by the community and national food security issues. In this consequence, this attempt to make a research on the household food security in Rukum district by analyzing the social and economical aspects and the behavioural attitudes of respondents towards the issue is suitable for the aggregate study of food security at regional or national level. This is the attempt to replenish the lack of analysis of food security at the household level in literatures related to Nepal.

Since Nepal is the mountainous and agricultural dominated country, the issue of food security is directly related to the development of agricultural production and activities. The UN/FAO has expressed deep concern about the small farm holders' agricultural production promotion which will be the milestone for the food sufficiency and food security at broad aspect. In this scenario, this research will be imperative for through understanding of the issues related to the household food security and different socioeconomic variables as well as the behavioural drivers significantly affecting it.

1.4 Research Objectives

The general objective of this study is to assess the socioeconomic and behavioural drivers of food security in Rukum district and recommend strategy for improvement of food security and welfare of rural population in Mid-Western Hills with particular focus in Rukum district.

The specific objectives to meet the general objective of the study are as follow:

i.   To assess the socioeconomic and behavioural variables of food security.

ii.   To assess the food security situation at the District, local and household level.

iii.   To analyze different socio-economic and behavioural variables of food security.

1.5 Hypothesis

Hypotheses for the study, which are based on the specific research objectives, are as follows:

i.   Incidence food insecurity in Rukum is higher than national level.

ii.   Incidence of food insecurity varies with the different socio-economic (sex, education, income, land and assets) and behavioural (consumption practices, dietary diversity) variables.

1.6 Scope and limitations of the study

The food security is the burning issue worldwide, though it hits hard to the rural communities of developing countries like Nepal. Since, the study being undertaken in the hinterland of the country, the typical rural villages in the Mid-Western Hills of Nepal, it will be an important contribution to link food security and management of natural resources in the region. In this sense, thorough understanding of the issue food security, based on the first hand information from the people could also be better aid to the different government and non-governmental organizations having organizational goal achieving the food security to all. Such organizations are believed to have achieved very less of their objectives despite their efforts in more than 50 years, spending very significant proportion of foreign assistance, mainly due to the lack of understanding on the issues.

However the study is concentrated on only one year and in one district. That may not be sufficient to generalize the findings for the whole region of the country where the food security is the critical issue. This result can be empirical for the similar geographical locations having similar socioeconomic situations and behavioural drivers. Further research is needed with emphasis in longitudinal data at different geo-ecological, climatic and socioeconomic settings to develop the complete scenario of food security at national level. Additionally, this research is carried out in rural setting; consequently the education level of the respondent is a limiting factor in the data collection process.

2 LITERATURE REVIEW

2.1 Concepts

2.1.1 Food security

Food security is considered as a topic that is not explicitly understood by all (Larson, 2006). It is defined in different ways by researchers and international organizations resulting into evolution of around 200 definitions (Maxwell, 1996). The concept food security has long been used as an important macro-level indicator of agricultural stability and progress. Approach to food security have traditionally focused on assessing aggregate levels of food supply, agricultural production, and the balance of agriculture trade (Reutlinger and Knapp, 1980). Till the early 1970s, food security was defined at the macro level as the ability to avoid short-term deficit in aggregate food supply, and was directly linked to grain stocks at the global and national level (Maxwell and Frankenberger, 1992). The world food crisis of 1972-1974 raised the roots of concern of food insecurity. World Food Summit (WFS) held in 1974 in order to respond the crisis came up with definition of food security. It defined food security as "availability at all times of adequate world supplies of basic food stuffs to sustain a steady expansion of food consumption and to offset fluctuation in production and prices". However, the continued prevalence of hunger and malnutrition despite the stabilization of food supplies at more than adequate levels proved it clear that aggregate food supply is not a useful indicator at the household or individual level.

Seminal work by Sen, 1981 on the phenomenon of famine brought the attention to the issue of entitlement and access to food by an individual or a household. Such access could be constrained by economic, social, and cultural factors at the household level. He argued that "an individual's entitlement is rooted in his/her endowment (the initial resource bundle), which can be transformed via production and trade into food or commodities that can be exchanged for food. If the entitlement set does not include a commodity bundle with an adequate amount of food the person must go hunger (suffers an entitlement failure)". Thus, food insecurity affects people who cannot access adequate food because of failure of entitlement (poverty) irrespective of food availability.

Food and Agriculture Organization (FAO) in 1981 further expanded the concept of food security by defining it as "the state of being ensured that all people at all the times have both physical and economic access to the basic food need" (FAO, 1983). The definition was supplemented by the utilization aspects as well later on in World Food

Summit (WFS) 1996, which is also a globally accepted definition of food security. The WFS (1996) defined the concept by stating that "Food security, at the individual, household, national, regional and global levels exists when 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, 2009).

The definition integrates availability of nutritionally adequate food, access to food, biological utilization of food, and stability over time (Lovendal *et al.*, 2006) and for food security the above four conditions should meet simultaneously. Food availability refers to the physical presence or reasonable proximity to the individual of sufficient quantities of appropriate food coming from domestic production, commercial imports, or donors. Access to food refers to adequate incomes or other resources to assure appropriate food consumption (Llull, 2008). It is an assured ability to acquire acceptable foods in socially acceptable ways that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies (USDA, 2008). Access means the legal, political, economic and social right over the source and properties that is awarded to the people by the state and community of concerned people (MOAC/WFP, 2009). Biological utilization refers to the ability of the individual to convert food commodities into energy (Llull, 2008). The consumption of required food, pure water, health facilities and hygienic environment to ensure the body requirement is its' another facet. This concept figures out the importance of the non-food materials. Similarly it also stresses about the nutrition consumption ability or digestive capacity of a person when optimum food material is consumed (MOAC/WFP, 2009). Finally, stability means that these conditions have to be fulfilled at present but also in any future point of time (Llull, 2008). This concept overwhelms all the three concept of food availability, accessibility and consumption for the sake of food security. Not only this it integrated the individual, household, and community food security and it urge that all have to have access towards abundant food materials and there should not be any negative fluctuations over time due to any natural hazards and physical consequences (MOAC/WFP, 2009).

Furthermore UNDP refined the definition of food security as "a state of affairs when all the people at all times have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life without compromising the productive capacity of natural resources, the integrity of biological systems, or environmental quality" (UNDP, 2000). All these definitions evolved after the seminal work of Sen (1981) agrees that the key defining

characteristics of household food security are the availability of food, access to food by all people at all times for an active and healthy life, and utilization. Therefore, calorie acquisition of households is determined mainly by four factors, namely; food availability, access to food, stability of the supply and access, and the degree to which food are nutritious and safe and can therefore be utilized (FAO, 2005). Food availability at household primarily depends on the actual production of food, which is influenced by ecological production potential as well as by available production technologies, and input and output markets. Besides domestic food production, stockholding, import of food from outside, and distribution mechanism determine the availability of food. Food availability is necessary but not the sufficient condition for attaining food security; access and utilization of food are important aspects of food security. If household cannot produce sufficient food, the income level of the household and the availability of food in the market determine their ability to procure food (FAO, 2005; Sen, 1981). Income simply refers to food entitlements, which are derived from human and physical capital, assets and stores, access to common property resources, and a variety of social contracts at household, community and state level (Sen, 1981).

Therefore, income or work opportunities or the ability to acquire food through production, exchange, or social entitlement institution or programs (Bista system[1] and food for work under rural infrastructure community work) serve as the important means to acquire food, which is determined by the level of household resource endowment such as capital, labor and knowledge, and on prices (Hoddintt, 1999). Several indicators such as access to proper health care, sanitation, safe water and other basic services have been used as the measures of utilization. The general hygiene and feeding practices along with health status and its determinants can also be used to assess the utilization aspects of food security. However, as it depends on the individual nature of human beings and is determined by the consumption and absorption capacity of that individual, it remains as a complex issue. Under-nutrition and malnutrition can be regarded as important indicators or outcomes of food insecurity, reflecting all the four dimensions of food insecurity (Joshi, 2008).

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[1] *Bista* system is the form of patron client relations between upper caste and lower caste in rural areas of the country, in which lower caste provides specific goods and services such as smithing (Blacksmith-*Kami* and goldsmith-Sunar), tailoring (*Damai*), and making drums and performing music (*Badi*), as well as construction work to upper caste for the upper caste group (Usually *Bahun,*and *Chettri*) in return for payment in kind (usually in the form of food-grain) on a customarily 'fixed' basis.

2.1.2 Food insecurity

Another important facet about the food security is its insecurity. In general, food insecurity simply is the condition lacking the security of food and is the just opposite of food security. Many literatures assume them a single issue either the food security or insecurity and assume to be two sides of a coin only. But few literatures have defined and described the food insecurity. Food insecurity has been described as a condition in which people lack basic food intake to provide them with the energy and nutrients for fully productive lives according to the Hunger Task Force in 2005. Households that are more likely to experience food insecurity are female-headed with children, those with incomes below the poverty line, and those that reside either in principal cities or within rural areas. Food insecurity exists when people are undernourished as a result of the physical unavailability of food, their lack of social or economic access to adequate food, and/or inadequate food utilization. Food-insecure people are those individuals whose food intake falls below their minimum calorie (energy) requirements, as well as those who exhibit physical symptoms caused by energy and nutrient deficiencies resulting from an inadequate or unbalanced diet or from the body's inability to use food effectively because of infection or disease. An alternative view would define the concept of food insecurity as referring only to the consequence of inadequate consumption of nutritious food, considering the physiological utilization of food by the body as being within the domain of nutrition and health. Malnourishment also leads to poor health hence individuals fail to provide for their families (Wikipedia, 2009).

The main reasons behind growing food insecurity are significant and endorsed mainly on the basis of the global hunger index and that of Nepal is 19.8 in 2009, reduced from 27.6 in 1990. Major causes of food insecurity are the deterioration of land, declining agricultural production and productivity, low nutritional, educational, and socioeconomic status of rural people especially the women, low government effectiveness, conflict, political instability and poor livelihoods. That lead to high child mortality and a high proportion of people who cannot meet their calorie requirements and contributes to a high prevalence of malnutrition as stunting and underweight in children under five (Welthungerhilfe/IFPRI/Concern Worldwide, 2009). There are strong, direct relationships between agricultural productivity, hunger, and poverty. Three quarters of the world's poor live in rural areas and make their living from agriculture. Hunger and child malnutrition are greater in these areas than in urban areas. Moreover, the higher the proportion of the rural population that obtains its income solely from subsistence farming (without the

benefit of pro-poor technologies and access to markets), the higher the incidence of malnutrition. Therefore, improvements in agricultural productivity aimed at small-scale farmers will benefit the rural poor first. Increased agricultural productivity enables farmers to grow more food, which translates into better diets and, under market conditions that offer a level playing field, into higher farm incomes. With more money, farmers are more likely to diversify production and grow higher-value crops, benefiting not only themselves but the economy as a whole" (Wikipedia, 2009).

Food insecurity can be categorized as either chronic (longitudinal) or transitory (Acute) food insecurity. Chronic/Longitudinal food insecurity is the prolonged state of inability to fulfill the nominal food requirement for a long time. In general, if there is the food unavailability for more than six months then it is called the longitudinal food insecurity. It translates into a high degree of vulnerability to famine and hunger; ensuring food security presupposes elimination of that vulnerability. Chronic hunger is not famine. It is similar to undernourishment and is related to poverty, existing mainly in poor countries. Transitory/Acute food insecurity is the temporary food insecurity for a short time period. This is inability to fetch the food requirement, for which there are probabilities to resolve the situation. It is occurred due to the occasional hazards and catastrophes (MOAC/WFP, 2009).

Furthermore, the stages of food insecurity range from food secure situations to full-scale famine. Famine and hunger are both rooted in food insecurity. The stages of food insecurity are determined by the Integrated Food Security Phase Classification Unit in Nepal. The classification is done by using the evaluation and inspection of regional characteristics, basic surveys, rapid assessment of emergencies and hazards, and other analytical tools. This has classified the stages of food insecurity in five stages and indicated with five different colors; Generally Food Secure (green), Moderately Food Insecure (yellow), Highly Food Insecure (orange), Severely Food Insecure/Acute Food and Livelihood Crisis (Red), and Humanitarian Emergency/Famine (Grey) (WFP, 2009) (Appendix 9).

In first stage, there is normal food availability, abundant accessibility, and the traditional processes of securing foods are adopted as the livelihood strategies. There is normal natural incidences and peace. But there is medium availability of food and limited access, frequent incidences of natural hazards causing the loss of food and assets, instable peace and governance along with the adoption of the strategies for sustainable food security in Moderate Food Insecure stage. The case is more difficult in highly food

insecure stage as there are regular and unexpected occurrences of shocks causing high deficit in availability and access of food. Further the malnutrition, natural hazards and shocks causing high loss of agriculture and assets, deteriorated peace and governance and the adoption of non significant temporary food security strategies threatening the livelihood assets make the situation more difficult and vulnerable in the third stage. The fourth is characterized with the regular and prolonged food deficit that results the severe decline in food availability and access. There are significantly high level of malnutrition, complete adoption of short term and non sustainable strategies of livelihood, high instability in peace and governance, the tremendous obstruction in the means of transportation and the severe natural hazards which is difficult to recover. Finally the most vulnerable and severe unavailability and access, great natural catastrophes and famine causing massive human death, and no remaining of the means and assets for livelihood are the characteristics of the fifth stage i.e. the Humanitarian Emergency stage (WFP/MOAC, 2009).

2.1.3 Approaches to address problems of food security

In general reduction of hunger and achievement of food security of several countries were characterized by more rapid economic growth and specifically more rapid growth in agricultural sectors. They also exhibited slower population growth, lower levels of diseases and epidemics and higher ranking in the HDI (FAO, 2003). Therefore addressing agricultural and population growth is vital to achieving food security. The several key steps proposed by USAID to increase the agricultural productivity which is in turn key to increasing rural income and reducing food insecurity are described below. The first is to boost agricultural science and technology. The current agricultural yields are insufficient to feed the growing populations. So the advancements in technologies are imperative so that crop productivity accelerates and more food will be available for increasing population. Eventually the rising agricultural productivity drives economic growth faster. The second is to securing property rights and access to finance of all human beings. The third is enhancing human capital through education and improved health. This increases the self reliance of community and makes them able to produce goods and promote economic activities that in turn reduce the investment in capacity building, health and training programs. Finally conflict prevention and resolution mechanisms and democracy and governance based on principles of accountability and transparency in

public institutions and the rule of law are basic to reduce the vulnerable number of society (USAID, 2009).

The United Nations millennium development goals are one of the most important initiatives aimed at achieving food security and eradicating hunger and poverty. The first MDGs aims to halve the hunger and poverty by 2015 in relation to 1990. That has stated the importance of agricultural productivity as the key factors for eradicating hunger and poverty if that is to be considered and exploited on time. Of the eighth MDGs, eradicating extreme hunger and poverty depends on agriculture the most. Notably the domestication of wild crops and underexploited crops appears to be an efficient alternative method of subsistence in tropical countries, which may play a role not only in poverty alleviation but also in food security (Claudio, 2006).

Right to food is the broad term that can be viewed in terms of food justice. The food justice is supposed to be an alternative view takes a collective approach to achieve food security. It notes that globally enough food is produced to feed the entire world population at a level adequate to ensure that everyone can be free of hunger and fear of starvation. That no one should live without enough food because of economic constraints or social inequalities is the basic goal. This approach is often referred to as food justice and views food security as a basic human right. It advocates fairer distribution of food, particularly grain crops, as a means of ending chronic hunger and malnutrition. The core of the Food Justice movement is the belief that what is lacking is not food, but the political will to fairly distribute food regardless of the recipient's ability to pay (Wikipedia, 2009).

Similarly another approach is known as food sovereignty; though it overlaps with food justice on several points, the two are not identical. Food sovereignty is the right of peoples to define their own food and agriculture; to protect and regulate domestic agricultural production and trade in order to achieve sustainable development objectives; to determine the extent to which they want to be self reliant; to restrict the dumping of products in their markets. Food sovereignty does not negate trade but rather it promotes the formulation of trade policies and practices that serve the right of peoples to food and to safe, healthy and ecologically sustainable production. During the 1996 World food Summit in Rome, La Via Campesina presented a set of mutually supportive principles that offered an alternative to the world trade policies and would realize the human right to food. Food sovereignty thus implies the right of individuals, peoples, communities and countries to the followings (Pimbert, 2009):

⟩ Safe, nutritious and culturally appropriate food and to food producing resources;

⟩ Define their own agricultural, labour, fishing, food, land and water management policies which are ecologically economically and socio-culturally appropriate to their unique circumstances;

⟩ Manage, use and control life-sustaining natural resources: land, water, seeds, livestock breeds and wider agricultural biodiversity, unrestricted by intellectual property right and free from genetically manipulated organisms;

⟩ Produce and harvest food in an ecologically sustainable manner, principally through low-external input and organic production as well as artisanal fisheries;

⟩ Choose their own level of self reliance in food and develop autonomous food systems that reduce dependence on global markets and corporations and

⟩ Protect and regulate domestic production and trade and prevent the dumping of food and unnecessary food aid in domestic markets.

It contends that multinational corporations have the financial resources available to buy up the agricultural resources of impoverished nations, particularly in the tropics. They also have the political clout to convert these resources to the exclusive production of cash crops for sale to industrialized nations outside of the tropics, and in the process to squeeze the poor off of the more productive lands. Under this view subsistence farmers are left to cultivate only lands that are as marginal in terms of productivity as to be of no interest to the multinational corporations. It advocates banning the production of most cash crops in developing nations, thereby leaving the local farmers to concentrate on subsistence crops. In addition it opposes allowing low-cost subsidized food from industrialized nations into developing countries, what is referred to as "import dumping" (Wikipedia, 2009). Food sovereignty promotes the community autonomy and reduces the chances of making poor countries more dependent on the international markets, driving small scale farmers, pastoralists and fisher-folk off their land and into cities and ultimately worsening people's food security (Pimbert, 2009).

2.2 Food security situation in Nepal

It was only in the early 1980s that food security as such entered the formal development agenda of Nepal following the world's attention to the problem during the late 70s. In the wake that the agricultural production growth rate being not in pace with the population growth rate and exportable surplus of food grain experienced proportionate

dwindling, increase in agriculture production in order to meet the domestic food demand remains the center point of the policy choice since then. The sixth five-year plan (1980-1985) sets an important objectives of fulfilling the minimum needs of the people together with increasing production at faster rate, and increasing productive employment opportunities (NPC, 1980). Later on, in 1985, following the directive of the King on the occasion of the Silver Jubilee Celebration of the Panchayat System, the program for the fulfillment of basic needs was prepared and made public. The document defined basic needs in terms of food (2250 kcal per capita per day), clothing, housing with kitchen and toilet, education (primary education for all children under the age of 10 years and higher education for as many adults as possible), health, and security. The document, however, lacked the quantitative target to be achieved within the given period i.e., from 1985 to 2000 (NPC, 1985). Furthermore the program was discontinued due to political change in 1990, transformation from party less Panchayat system to multiparty democracy.

Despite the target of high agricultural growth, the country which previously was the net food grain exporter started to become a net importer since 1987/88 (Koirala and Thapa, 1997). Between the periods of 1974 to 1992, the country experienced the sharp decline in per capita gross food production from 376 Kilogram (Kg) to 277 Kg (APROSC/JMA, 1995). Throughout the 90s, the country was under food grain deficit situation. Figure 2.1 shows the food grain balance of the country for the period between 1987/88 to 2006/07.

The figure depicts that the country started attaining food grain self-sufficiency from the year 2000 and maintained it only till 2004/05. The annual growth rate of food grain production for the period was 2.4 percent per year, which is below the growth rate of the food grain requirement (3.2 percent) of the country for the given period (CBS, 1997b; FAO/WFP, 2007; MOAC, 2005). Agriculture in the country solely being dependent on weather, only 15 percent of the cultivated land is irrigated year round, which is a major factor behind huge fluctuation in the production despite expansion of the area under cultivation during the period (NPC, 2003). In addition, supply of essential production input such as improved seeds, fertilizer, and pesticides in not regulated in terms of quality, quantity, and timely availability (Joshi, 2008).
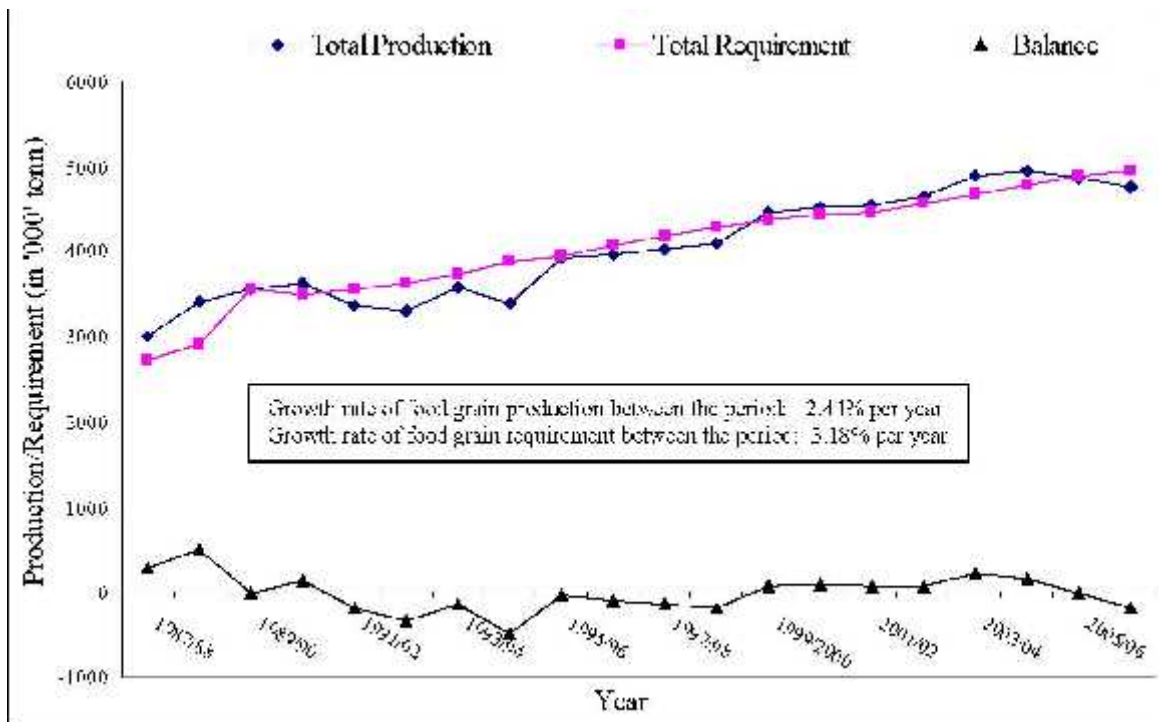
Figure 2.1 Food grain production and requirement of Nepal (1987/88-2006/07*)

Source: (FAO and WFP, 2007; MOAC, 2005; CBS, 1997b).

*Note: Total production figure for 2006/07 is estimated amount.

Nepal is highly food insecure country which is demonstrated by following factual information, 39 percent of children below 5 years age are undernourished, About half (49 percent) of the children are stunted, 20 percent of ultra poor spent their 73 percent total income for food purchase only, 40 out of 75 districts are food deficit. About eight million people (31 percent people) are below the poverty line i.e. income less than one dollar per day (MOAC/WFP/FAO, 2009).

The country predominantly being agriculture dependent, which is suffering the ever-rising huge trade deficit with quite higher import growth rate compared to the export growth rate, food grain deficit simply suggests that the country is facing critical challenge of maintaining food security at the national level (MOF, 2007). Besides, 61 percent of the households, for whom agriculture is the dominant means of fulfilling household food demand, were not able to produce sufficient food in their farm even though the country was self-sufficient in food grain (CBS, 2008). Regional variation in production and requirement of the food grain reflects the different scenario than the national one. Throughout the period, even when the country was achieving the food grain self-sufficiency, Mountain and Hill regions of the country were under the food grain deficit situation, where access was further hindered by the limited market access. In the year

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2001, 13 out of the 16 districts in the Mountain and 33 out of 39 districts in the Hills suffered the food deficit situation (Subedi, 2003). This led to per capita food grain deficit of 47 Kg per capita per year in the Mountain and 32 Kg per capita per year in the Hills, in contrast to the food grain surplus of 45 Kg per capita per year at the national level (Pyakurel et al., 2005). In the year 2006/07, number of food deficit districts came down to 44 districts but the total food grain balance reached negative (FAO/WFP, 2007).

The food grain deficit has been a long term problem in Mid and Far -Western Hills and Mountains. Sixteen out of 19 districts in Mid and Far-Western Hills of Nepal were suffering food deficit situation in the year 2001/02 (Pyakurel et al., 2005). The same situation still prevails in the regions. This means that in the context of production being grossly inadequate and economic access of food being limited by low purchasing power due to almost non-existence of market caused by the very limited or no road infrastructure in the region, food grain deficit simply reflects the chronic food insecurity problem in the regions (FAO/WFP, 2007). That is clearly shown by the food security classification map given by WFP in figure 2.2 and subsequent figures 2.3 and 2.4.

The declining productivity of the land in the Hills and Mountains were identified as the main cause of shortfall in domestic production. In addition, huge dependence on the weather due to lack of irrigation facilities, and lack of investment in infrastructures such as roads are contributing to stagnant, if not declining agricultural production in the region (FAO/WFP, 2007; Pyakurel et al., 2005; NPC, 2003; Koirala and Thapa, 1997; APROSC/JMA, 1995).

Besides national production and requirement figure, proportion of under-nourished population can also serve as the indicator of food insecurity in the country. Under-nutrition refers to the condition of people whose dietary energy consumption is continuously below a minimum dietary energy required to maintain a healthy life and carrying out light physical activity (FAO/WFP, 2007). The proportion of the undernourished population in the country increased from 20 percent in the year 1990-1992 to 22.5 percent in the year 2001-2003. This resulted into significant increase in the real number undernourished population in the country. It has increased from 3.9 million to 4.1 million within the decade. It further reached 5.6 million from the year 2001to 2004 (Table 3.1).

Table 3.1 Health indicator of food security of Nepal

Indicator	Number	Proportion
Undernourishment (Calculated based on minimum requirement of dietary energy consumption-MRDEC of 1810 kcal/person/day)		
1990-1992 (average)	3.9	20 percent
2001-2003 (average)	4.1	17 percent
2004	5.6	22.5 percent
2004*	10.1	40.7 percent

Source: (FAO/WFP, 2007; MDG Info, 2007). Note: * MRDEC of 2124 kcal per person per day.

Seddon and Adhikari (2003) pointed out factors such as socio-political structures, which effectively prevent the rural poor from having equitable access to production resources and community assets, persistent degradation of natural resources and community assets, imperfect mechanisms for the distribution of goods and services, conflict and it's lingering, suspension of food aid programs in some districts, and etc as the major cause of undernourishment.

Similar to the balance of food grain requirement, geographical variation prevails in terms of incidence of undernourishment as well. At the aggregate level of MRDEC, the proportion of undernourished population is the highest in the Mid-Western region with the figure of 48.5 percent, which is followed by Far-Western region (47.5 percent). Similar trend is also followed in terms of ecological belt, the Mountains has the highest proportion (46.3 percent) of undernourishment, followed by the Hills (41.8 percent) and the Terai with 38.4 percent of undernourishment (FAO/WFP, 2007).
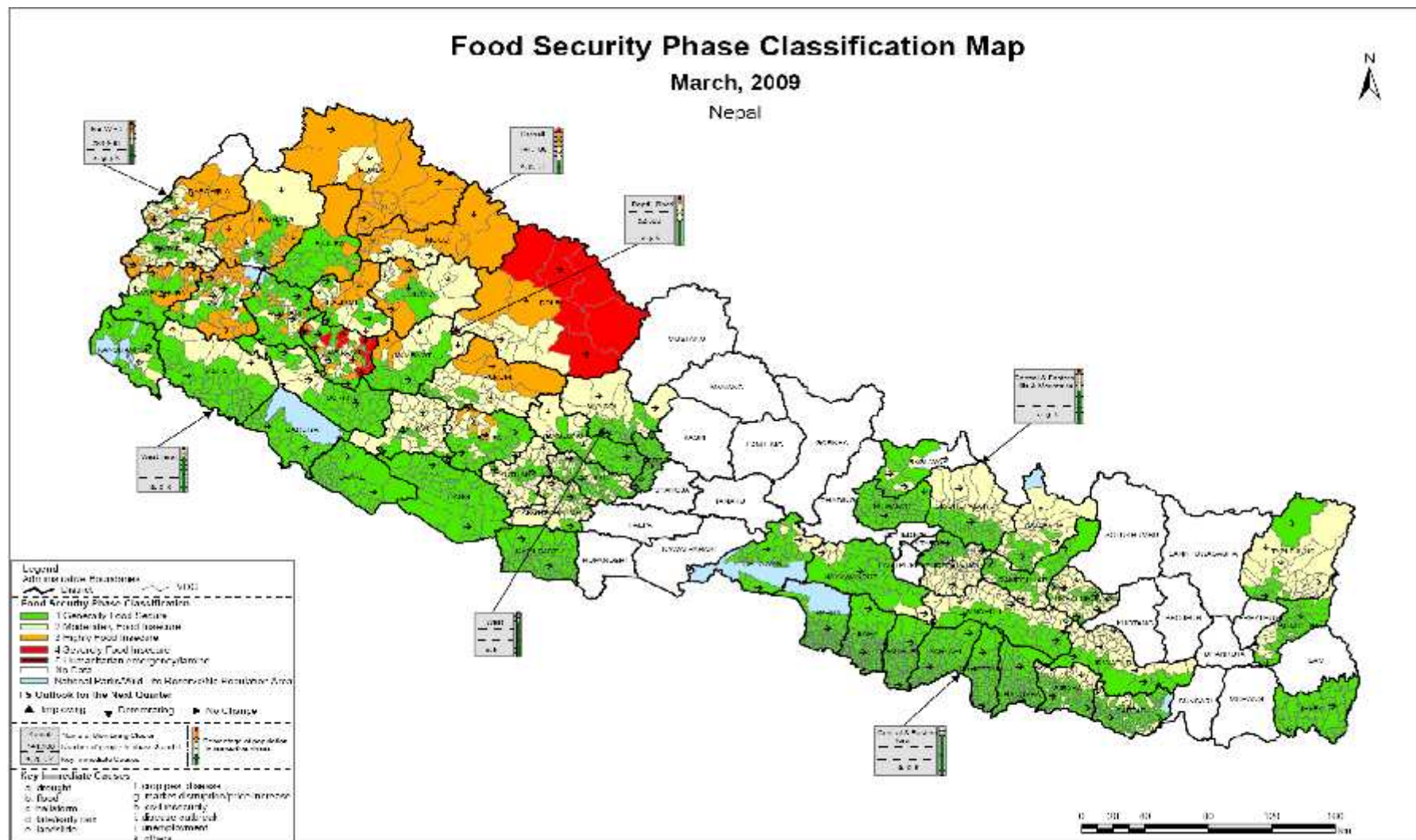
Figure 2.2 Food Security Classification Map, Source: WFP, 2009

Figure 2.3 Map of Nepal showing sample district and development indicators for each district
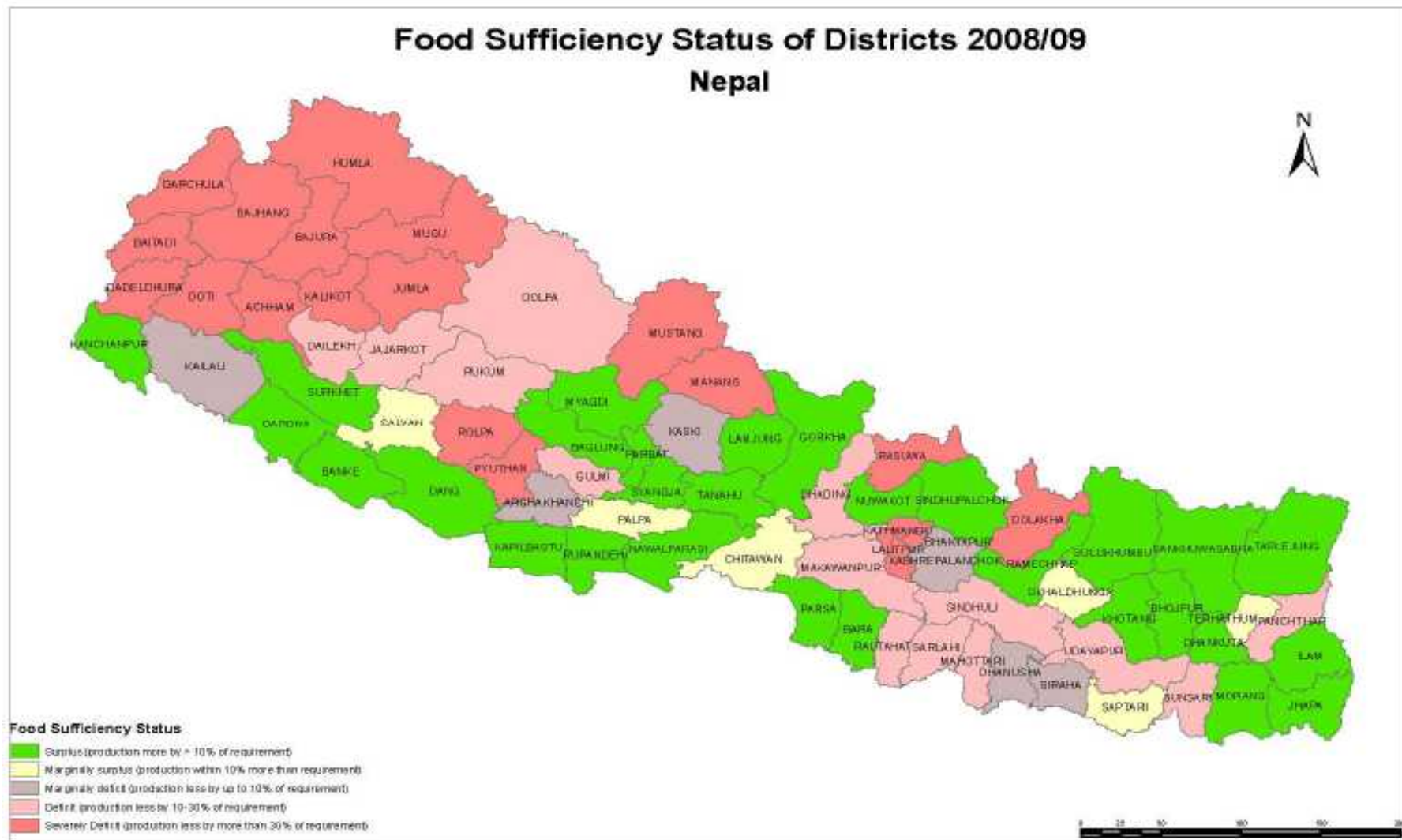(Adapted from http://www.dlgsp.org.np/resourcepop.html)

Figure 2.4 Food sufficiency status of districts 2008/09, Source: WFP, 2009

The per capita mean dietary energy consumption in Mid-Western region is reported to be 2250 kcal/person/day in contrast to the figure of 2534 kcal in Rural Western region, and 2405 kcal of the national average. In case of ecological belt division, the level is the lowest in the Mountains with the consumption level of 2297 kcal, compared to 2404 kcal in the Hills and 2426 kcal in the Terai. It is also reported that Rural Mountains and Hills in the Mid and Far-Western regions host the very high proportion of population under severe deficit of food energy intake. The crisis situation prevails in the region with more that 30 percent and 20 percent of the rural population consuming less than 1600 kcal/day in Mid-Western Mountains and Far-Western Hills, respectively (FAO and WFP, 2007). Such consumption level is substantially lower than the nationally set minimum dietary energy consumption requirement of 2124 kcal/person/day (CBS, 2005c).

The WHO classified Nepal to be under the crisis level of malnutrition. Nepal ranked last among 177 countries in terms of the proportion of children classified as underweight with 48 percent incidence (UNDP, 2007). Other aggregated malnutrition indicators such as stunting and wasting is also higher in the country. Stunting is as high as 49 percent and wasting is 13 percent. Regional variation suggests the highest incidence of stunting, wasting, and underweight in the Mountains and Hills of the Far and Mid-Western Development Regions. In the region, more than 60 percent of the children are stunted and around 50 percent are underweight (MOHP/New Era/MII, 2007). This prevalence is mainly caused by the limited availability of food, and high poverty rates in the region (Joshi, 2008).

2.3 Policies and programs to tackle problems of food security in Nepal

Basic Needs Program, the efforts to increase aggregate agricultural production, the pursuance of poverty alleviation programs, training and income generating programs, subsidies, and food and feeding programs are some of the important initiatives taken by the government of Nepal in order to deal with the food insecurity problem of the country. Food and feeding programs include Nepal Food Corporation's attempt to reduce inter-regional food imbalance, food for work program-the Rural Community Infrastructure Works (RCIW), food for education program, the nutritious food program, and the joint nutrition support program. These programs were implemented with the support of international organizations, especially the World Food Program (WFP), Food and Agriculture Organization (FAO), United Nations Children's Fund (UNICEF), German Agency for Technical Cooperation (GTZ), the United Kingdom's Department for

International Development (DFID), and Danish International Development Agency (DANIDA).

Though the basic needs program contained the elements of successful poverty alleviation, focus on intensification of existing programs often without addressing the reasons of their past failure was considered as the main shortcoming of the program. Later on, especially after the reestablishment of democracy in 1990, the government realized the absence of employment and income generation issues as the important missing components to meet the basic needs in basic needs program. Therefore, the eighth plan (1990-1995) focused on the need for employment generation giving priority to the targeted groups. The important aspect hindering the achievement of poverty and food insecurity in the country, population growth, however, was accorded less priority.

Fertilizer subsidies, credit subsidies, irrigation subsidies, and food subsidies were the main subsidies program targeted in order to achieve the goal of poverty and food insecurity alleviation in the country in the past. A study on the impact of fertilizer subsidy revealed that the subsidy has very little impact on the poor, mainly because they do not use fertilizer as they practice rainfed agriculture with limited scope for fertilizer use, supplies through government body i.e., Agriculture Input Corporation (AIC) were unreliable and not available at the key times, and subsidized fertilizer was deflected to India, Kathmandu or went to the better-off class households. Credit subsidies were provided in terms of interest and capital subsidies in order to encourage productive investments in agriculture through the Agricultural Development Bank of Nepal (ADB/N). This program also has the little direct impact on the poor. Coupled with low level of education attainment, and physical resources possession, the poor have neither the access nor the capacity to use institutional credit, thus less than 10 percent of such subsidized credits went to the small farmers (Prennushi, 1999; World Bank, 1991). Subsidy in irrigation was indirect in nature. The government bears the operating costs of public irrigation scheme. Also grants were provided for capital costs of small irrigation schemes. These were also supposed to have very limited impact on the poor as they do not tend to cultivate in irrigated land due to lack of access on irrigation.

These subsidies were gradually lifted by the government, and distribution was deregulated due to the adoption of Structural Adjustment Program (SAP) in 1985/86, and finally such subsidies were eliminated in 1998/99 and markets were deregulated. The consequences were increased cost of fertilizers leading to the drastic fall in chemical fertilizer use in 1990s to the 1970s level (Subedi, 2006). Per hectare use of fertilizers also

showed the declining trend. It came down to 21 Kg in 2005/06 from 26 Kg in 2003/04 (FAO/WFP, 2007). Removal of subsidies in Shallow Tube Well (STW) also has an adverse effect on expansion of irrigation. There has been even decrease in ground water irrigation facilities since 1997/1998, which is forcing small holders to rely on monsoon (FAO/WFP, 2007; Subedi, 2006). There was also removal of preferential credit and withdrawal of bank branches from the rural areas due to the SAP. Together with the heavy reliance on weather, these factors could have affected the fluctuation in the production of food grain in the country.

Food subsidies is mainly targeted at providing food at below market price to civil servants and the population as a whole in remote areas where there is no connection with the land transportation and also no food is available for sale in large parts of the year. It was done by buying food from surplus areas by Nepal Food Corporation (NFC) and was aimed at reducing inter regional food imbalance. However, guided by political interest, NFC distributed most of the procured foods in the Kathmandu Valley. It usually supplies around 5-6 percent of the deficit in the rural areas, and beneficiaries most often are government officials and well-off households of the region (FAO/WFP, 2007; WB, 1991). Despite inefficiency in the functioning of the NFC, there is growing need for such strategy as the population growth rate continues to outstrip agricultural production and the region still being isolated. In order to improve efficiency in its functioning, the NFC developed the concept of local grain storage program. A local grain storage program aims to reduce seasonal price fluctuations by providing the opportunity for the poor farmers to hold grain after harvest until prices rise. Organization of saving group for poor farmers with rotating loan funds is supposed to provide an escape for stress selling of their crops immediately after the harvest in order to pay debts.

Food-for-work or the RCIW program, food-for-education program, mother and child health initiative program, and emergency assistance in natural disasters are other undergoing food and feeding programs with the support from various international donor agencies. Food-for-work program appears to be more successful in reaching the poor in terms of providing rural employment opportunities through rural infrastructure construction and income generation projects that make a payment in kinds-food items (FAO/WFP, 2007; RCIW, 2003; World Bank, 1991). Currently, the program covers 30 districts throughout the country. During the time between the year 1991 and 2007, the amount of food NFC is handling came down from 34000 metric ton to 20,000 metric ton

per year mainly due to the hindrance caused by the Maoist conflict (FAO/WFP, 2007; Sheddon and Adhikari, 2003; World Bank, 1991).

Similarly, a food-for-education program provides a mid-day meal and a take-home ration of oil for girl students in 18 districts. The program is directed at improving the nutritional status, school enrollment, and attendance by girl children. A Mother and Child Health initiative operating in 11 districts aims at improving the health and nutritional status of pregnant and nursing mothers and their young children by providing essential nutritional food support in the form of monthly take-home ration of fortified food (FAO/WFP, 2007).

The combined impact of these food and feeding programs is relatively small compared to the magnitude of the food insecurity problem in the country. Programs of the NFC, and food and feeding program represents less than 10 percent of the national food deficit (FAO/WFP, 2007; WB, 1991). Also the coverage of food and feeding program is very much limited. Thus, most of the programs in the country so far are not able to improve food security at the household level in equitable way.

2.4 Empirical Studies of food security

The exact and empirical works in the household food security in context of Nepal is very scarce. The abundance of the reports of the institutions working in food security only provides information but not the analytical reviews and materials. Joel Gittelsohn and his colleagues made their efforts to operationalize the household food security in Paharagaun of Western rural Nepal in 1997. They have developed a conceptual framework to assessing household food security, i.e., the use of scales to measure past, current, and future component of household food security. They had reviewed that household food security has three different dimensions: past food supply, current food stores, and future supply of food adequate to meet the needs of all household members. They have constructed scales namely, the past food stability, current food supply/stores, and future food productivity scale that capture these different aspects of household food security. Finally through the operationalization of previous setting, household food security was found linked with increased consumption of non staple foods. Past household food security was the precursor of increased frequency of meat consumption and increased variety of food consumed while present household food security predicted higher frequency of meat and dairy intake and greater dietary variety and future household food

security is associated with increased total dietary variety and future consumption of dairy products.

One of the main development goals of Nepal is to reduce the number of chronically undernourished people all over the country by half by the year 2015. In consonance to this, Maharjan, 2006 examined food security and its relationship with socio-economic characteristics among rural households in the remote western mountains of Nepal. Accordingly, the relationship between household's resource endowment and food security status was analyzed based on the calorie requirement for all household members according to their sex and age. The food security measures applied in this study were Head Count Method, Food Insecurity Gap, and Squared Food Insecurity Gap to capture successively more detailed aspects of the food insecurity status of the household. It was found that majority of the households in the region were food insecure and depth and severity of food insecurity varied according to socio-economic characteristics of the households. Resources were disproportionately distributed in favor of higher castes and these groups were more food secure as compared to lower caste people. As compared to food insecure households food secure households had small family size, lower dependency ratio, higher percentage of irrigated land, and more total land and livestock holdings. Hence, it was concluded that food security strategies should consider socio-economic characteristics of households in order to achieve more than a marginal reduction in the number of chronically undernourished people.

Those findings were further refined by Joshi, 2008 doing research on household food security on Parbat district of Nepal. Similar to Maharjan, he found education, occupation, gender of household head, and family size to be the most important factors that affect food insecurity. He also found that caste and landholding size had significant effects on household food security. He concluded that households with illiterate head, head engaged in laboring, female head, larger family size, Dalits and small land holding were suffering from food insecurity in greater extent. Further the food insecurity measure showed the higher incidence, gap, and severity of household food insecurity for all variables like the gender, caste, education, occupation, family size category, and landholding category considered for the study.

The Ministry of Agriculture and Cooperatives (MOAC), United Nations World Food Programme (WFP) and Food and Agriculture Organization (FAO) have jointly assessed the crop and food security status during winter draught of 2008/2009. The joint assessment report published in 2009 concluded that the 2008/2009 winter draught in Nepal

was one of the worst on history. There was little or no rain during November to March causing severe draught and failure of winter crops. Further the Mid and Far Western Hills and Mountain Regions experienced significant summer crop losses due to the excessive rainfall and disease. In addition, the impacts of this draught on food security had occurred at a time when a huge portion of populations were reeling from the sharp food price spikes of 2008 and 2009. This report had pointed out the increasing prevalence of natural disasters within Nepal, including draught, flooding, landslides and large hailstorms, which was the major indication of global climate change. These natural disasters continue to expose the vulnerability of Nepal's agricultural situation since the country has commonly experienced food production deficit since the 1990s. This report urged for the urgent investment to cover the immediate food shortage and agricultural improvement for long term remedy of the food security problems (MOAC/WFP/FAO 2009).

Babu and Andersen (2000) have stressed on the better identification of current challenges that enlist the information gap, policy research and institutional arrangements to accelerate the economic reform process in the food, agriculture and natural resources sectors that will lead to poverty reduction, increase food security, and sustainable use of natural resources taking reference of Central Asian Republics for achieving food security (Babu and Anderson, 2000).

Maxwell, Caldwell and Langworthy (2008) developed the coping strategy index (CSI) as a context- specific indicator of food insecurity that counts up and weights coping behaviors at the household level. That indicator has been proven useful to operational humanitarian emergencies stages and researchers in measuring localized food insecurity, but not to compare the relative severity of different crises and therefore not been particularly useful for geographic targeting or resource allocation. A new identification of sub set of individual coping behaviors develop another comparative indicator and could be used to compare the types of food security crisis analyzed across different contexts with no loss to the context specific nature of the original CSI, to improve geographic targeting and resource allocation, according to the severity of crisis.

UN/WFP has conducted the analysis of household food security in selected districts of Madagascar in 2009 to measure the impacts of different shocks on household food security and to provide key household level information in crop and food security. The major findings were about the average household size (5.8 persons), households headed by women (17 percent), age of household head (44 years), recent death of household member (5 percent), livelihoods, livestock holding (40 percent), per capita

income, household assets and resources, dietary diversity and food frequency (5 percent poor, 33 percent borderline and 62 percent acceptable food consumption), shocks and coping (economic shocks mainly), food security and vulnerability analysis in terms of different variables discussed above. The analysis concluded that agricultural production shocks and limited ability to access food were the major causes of food insecurity of food insecure households in the south Madagascar. In addition, lack of resources and income opportunities made difficulties in accessing food and result the chronic food insecurity in chronically food insecure households in the lower eastern half of the country (UN/WFP, 2009). Similarly the assessment of vulnerability and food insecurity in urban areas of the small landlocked country Swaziland mainly in term of the impacts of high prices on household incorporated deeper understanding of livelihoods in the context of the Swazi society, both rural and urban. The main objectives of the assessment were to provide an understanding of the impact of prevailing and future food prices on individual households in the urban areas of Swaziland and to identify possible solutions for the vulnerable population. The assessment found the causes of food insecurity and vulnerability in urban were different than that found in rural settings and the small business holder, lower wage group, petty traders, and daily/agriculture wage labor were the vulnerable group in context of high prices of food since they had lowest per capita income.

Holden and Shiferaw (2003) had used the bio-economic model in Antid Tid, the highland of Ethiopia to analyze the combined effects of land degradation, population growth, market imperfections and increasing risk of drought on household production, welfare and food security. They had concluded that the indirect effects of the drought on household welfare through the impacts on crop and livestock prices were larger than the direct production effect of drought; however the drought had great threat for food security.

Nouve (2004), conducted a research in Mali to understand how, and the degree to which, these reforms would affect welfare and food security in Mali. The analysis is based on computable general equilibrium (CGE) simulations using a 1997 social accounting matrix. He had used the Hicksian equivalent variation to measure welfare impacts, as well as the use of changes in household food consumption as a proxy measure of food security. The analytical method he used was a single-country computable general equilibrium (CGE) model in the neoclassical structuralist tradition. The Malian model was based on a standard CGE model from the International Food Policy Research Institute, which is itself based on the Dervis, de Melo and Robinson (1982) seminal work. The CGE framework uses data from a disaggregated social accounting matrix, and the simulation results

represent counterfactuals trade reform scenarios. The results revealed that Mali had as much to gain from increased agricultural reforms in world markets, as it had to gain from deepened commercial integration in West Africa. The gains would amount to an average of three percent of initial income levels. Further, the results also indicated that expanding existing trade preferences would raise incomes and food consumption in Mali, whereas reducing or eliminating these preferences would reduce incomes and weaken food security in Malian households.

Chidumu (2007) had conducted a research in One Village One Product (OVOP) operation area of Bvumbwe in Thyolo district, Malawi to assess the impact of OVOP program on households' farm income and its implications on food security. A likert scaling technique was used to rate farmers' perception of the effect of OVOP on farm activities. From the study, a significant difference in the levels of household farm income between beneficiaries and non beneficiaries of OVOP was found. The OVOP beneficiaries were found to be better off in terms of household food security through increased food basket, enterprise diversification and food access which was attained through higher farm income. Participation in OVOP and household size were found to be significantly associated with household farm income.

A review paper by Karki, 2008 expressed the concern in the increasing CO_2 level will ultimately increase the crop yield with absorption of more CO_2 and increase in photosynthesis. There should be the provision that crop should tolerate increased temperature caused by higher CO_2 concentration. Thus increased crop yield will be promoter for food security condition in Nepalese context, where C_4 crops (maize, sugarcane, sorghum, millet etc) are economically significant.

Merten and Haller (2008) argued that the food security was largely influenced by the right on property on the basis of a case study in Kafue Flats of Zambia. They showed that the unclear allocation of right on property and weak authorities facilitated unequal distributions of natural resources between different villages according to the history of immigration and ethnicity. Households, reported increased difficulties with access to natural resources, had less diversified income generating activities, lower food intake and more children showing impaired growth.

Flores, Khwaja and White (2005) argued that standardized, short term intervention designs should be created and implemented ensuring the needs of affected populations in the short term and long term without exploiting the range of policy options available to tackle different dimensions of food insecurity in complex and fluid crisis situation.

Pingali, Alinovi and Sutton (2005) have explored the linkage between food security and crisis in different context, outlining the policy and institutional conditions needed to manage the food security during a crisis and to rebuilt the resilience of food systems in periods of relative peace. They have done assessment of different alternatives in fragile countries and proposed a Twin Track Approach developed by UN system and World Bank to enhance the food security resilience through specific policies for protracted crises that link immediate hunger relief interventions with a long term strategy for sustainable growth.

2.5 Conceptual Framework

Food security, which is among the most important outcome of the socioeconomic and behavioural drivers adopted by the rural areas, is considered for the analysis. Socioeconomic and behavioural derivers generally comprise the socioeconomic status and combination of activities and choices that people undertake in order to achieve their food security and livelihood strategies.

The rural households throughout the history of Nepal have followed multiple survival activities and strategies. Farming used to be the main source of livelihood. Farming in the country essentially consists of crop, livestock, and forest and natural resource each using products and byproducts of the others in an efficient way. All these three components of farming together were able to supply food, fuel, medicine, shelter, labor and other needs of the households of different sizes and ethnic/caste groups. Thus, the farm products were consumed directly or indirectly through exchange system, such as by exchange of foods, or by borrowing foods to meet the food needs. The relationship between these farm components has been maintained traditionally for centuries through community participation based on the concept of mutual aids, which also determines sustainability of the system (Maharjan, 2003).

Permanent and temporary migration to other areas of the country and beyond was another major strategy adopted by households in the 18th and 19th centuries (Adhikari and Bohle, 1999). Poor in search of secure livelihood and even relatively wealthier hill farmers for economic progress was the main actor of migration. Migration among rural households took place as a response to economic hardships caused by population pressure (Adhikari and Bohle, 1999; Poffenberger, 1980), and land and labor policies (Shrestha, 1990).

Vulnerability to subsistence Mountain farming and farming community as a whole was added due to fragile and marginal nature of the farming system, and inaccessibility. In

addition, low literacy rates, non-existence of physical and social facilities, high dependence on fragile agriculture, and low levels of food self-sufficiency at household level existed in rural areas of Nepal, aid to the vulnerable situation in the areas. Thus, failure of the integrated use of the subsistence agriculture and natural resources from which they were neither able to generate economic surplus nor were able to find off-farm income employment opportunities resulted into vigorous change in livelihood strategies (Maharjan, 2003). Rapid population growth and degradation of the resource base resulted into shifting of their emphasis from subsistence farming to other sources of income to maintain their livelihoods (Adhikari and Bohle, 1999).

Market penetration due to liberalization and globalization also brought considerable changes in livelihoods strategy even in rural areas. There was gradual breaking up of the isolation of rural people providing them with greater option to secure their livelihoods or diversify their livelihood strategies to gain resilience. Rural people currently are securing their livelihoods through serving the needs of the urban and wealthier households by supplying them with quality village products including both agricultural and non-agricultural products like milk, ghee, herbs, wild foods and stone slate etc. In addition, increased opportunities for seasonal and short-term labor migrations are helping them to meet the livelihood demands. The overseas and out country employment is another important strategies and the main economic driver of rural communities as well as Nepal. In overall, migration has become so common that even during harvest season, 44 percent of households across Nepal have one or more family members absent pursuing distant labour opportunities (WFP/NDRI, 2009). Strategy of securing livelihoods by consuming cheap and low quality food products by selling their home produced quality goods at higher prices is also possible due to market penetration (Adhikari and Bohle, 1999). Thus, securing food through exchange system such as by the purchase/exchange of food or by borrowing food or money to purchase food is common (UNDP, 2005). With this, the farmers turn to non-farm activities, agro-based and or non-agro-based in nature within the rural regions and beyond, creating a new paradigm of livelihood inducing dynamism (Figure 2.5).
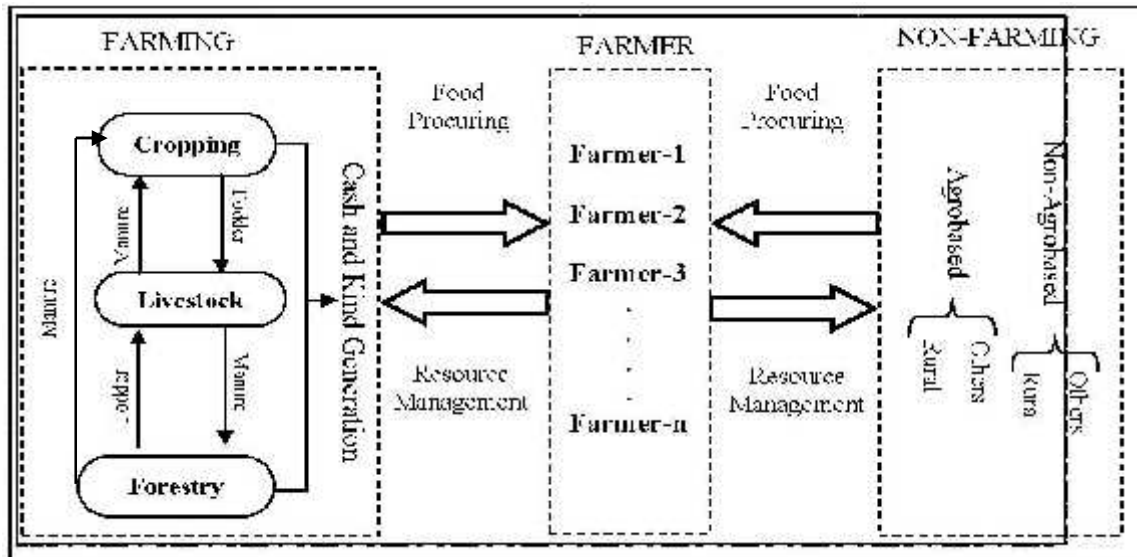
Figure 2.5 Recent dynamism in the food securing process

Source: Maharjan, 2003

Agro-based non-farm activities are food and agro-processing and marketing activities such as, processing of rice, wheat, edible oil, milk, meat and other agricultural products, their marketing and transporting and so on. Other non-farm activities are physical construction work relating to irrigation, roads, cottage industries, tailoring, governmental and non-governmental work, tourism, laboring and so on. Non-farm activities beyond rural areas are many and diverse like government work, small and large entrepreneurship, shop keeping, factory working, transportation, laboring and migratory laboring and so on (Maharjan, 2003). Most of the households combine these different strategies to minimize risk and optimize the use of natural and economic resources (Muller-Boker and Kollmair, 2000).

The following frameworks (figure 2.6 and 2.7) were used for the study of food security condition in Rukum district. The food security of Rukum is described on the basis of the status of food insecurity of that district which is depended upon different social, economical and behavioural variables. Such social variables are the age, sex, ethnicity, educational level, access to food and social participation. Similarly the economic variables are main occupation, resources holding such as landholding, types of house, family size, livestock holding, crop production and productivity, food sufficiency and stock, and family income or loan. The next crucial factors affecting the household food security are the behavioural factors like food consumption practices, cropping patterns and intensity. The other crucial factors are the behavioural variables as the cropping pattern and intensity, consumption pattern, dietary diversity and coping strategies for food security.

Social factors
Age, Sex, Ethnicity, Educational Level, Access to Food and Social Participation

Economic factors
Main Occupation, Resources holding such as landholding, Types of house, Family size, Livestock holding, Use of inputs, Crop production and productivity, Food sufficiency and stock, and Family income or loan

Behavioral factors
Cropping pattern and intensity, Consumption pattern, Dietary diversity and Coping strategies

Household Calorie Consumption

Household food security/insecurity
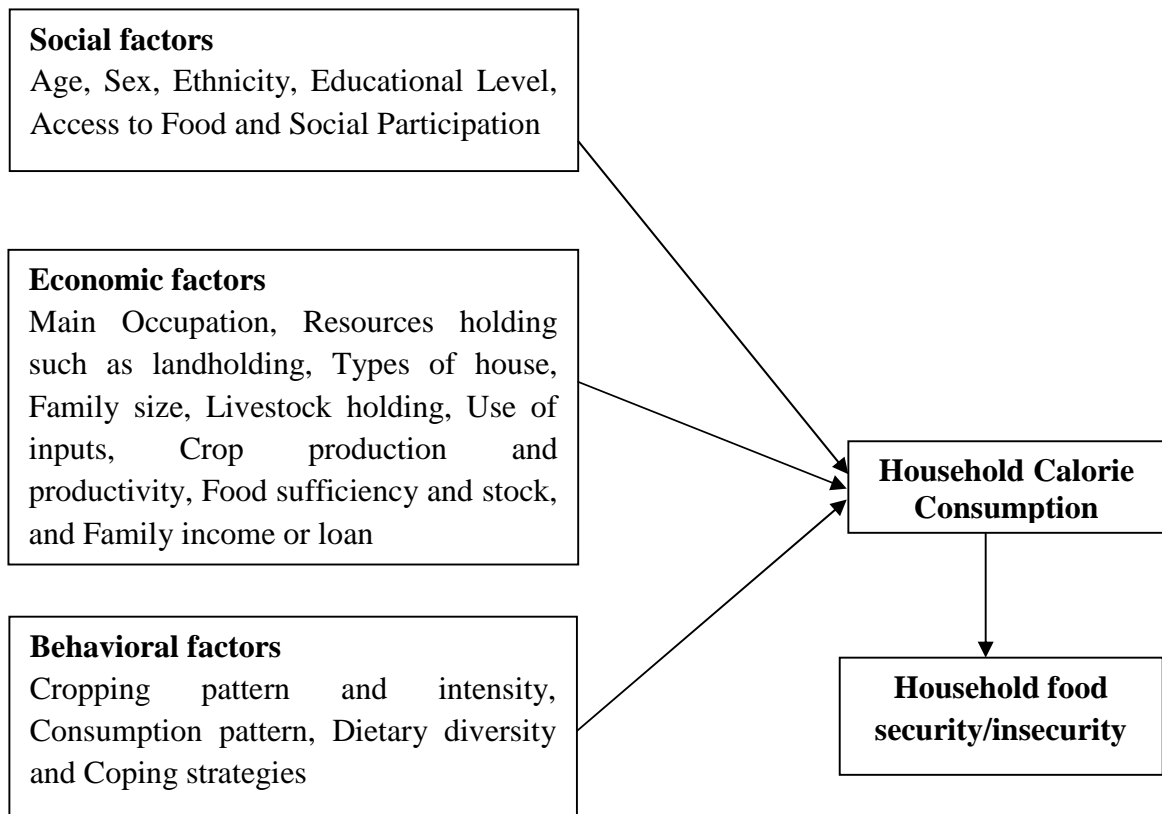
Figure 2.6 Variables affecting the household food security.
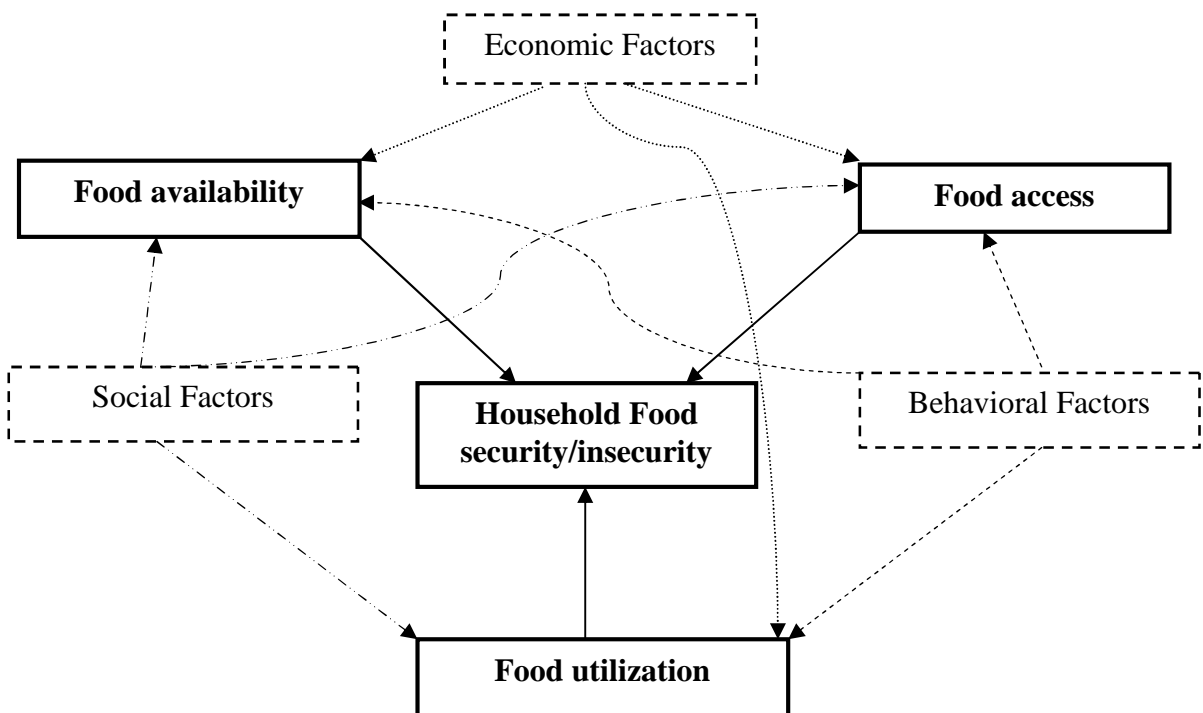
Figure 2.7 Conceptual frameworks for the socioeconomic and behavioural assessment of household food security in Rukum district.

Furthermore, the impacts over the household food security by different social, economic and behavioural variables are studied under the framework presented above. Food availability is influenced by different economical and behavioural variables like the crop production and productivity, use of inputs, cropping pattern and intensity, age(economically active), occupation, family income and loan. The education level and social participation also have direct impact on the food availability. The food assess is correlated with the household access to food, education level, ethnicity, sex, occupation and income. Finally the food consumption is largely dependent on the consumption pattern, educational level, dietary diversity, food sufficiency and food stock, and the coping strategies. The inter-relation and interactions of above variables determine the role and size of the three dimensions of food security namely, the food availability, food assess and food consumption. Here, study has done of single year only so the stability of these three facets of food security would not be possible. Therefore following framework of study is applied for the socio-behavioural assessment of food security in Rukum District of Nepal.

3 RESEARCH METHODOLOGY

3.1 Sources of Data and Information

3.1.1 Selection of study area

This study was conducted in the Mid-hills of Mid-Western Development Region of Nepal, which is one of the most vulnerable regions in terms of food security. This region has 53.3 percent food deficit with 2.5 percent of reduction in total crop production in 2009. At the same time the reduction of total crop production for the hills of Mid Western Region is 6.6 percent. From this region, Rukum District was selected for the purpose of the study. That is one of the food deficit and hilly districts, producing 30 percent less food materials than required (WFP, 2009, winter draught) which results 13000 people highly food insecure and starting to affect the livelihood assets of these households. Based on the incidence of food insecurity and poor socioeconomic condition, such as high number of female headed households in comparison with other development regions, low cropping intensity and crop production, dominance of Janajatis, least access to road and markets, poor health and educational services, poor agricultural and livestock services, and decreased winter crops production (33 percent decrease of wheat), this district was selected purposively.

Similarly, the vulnerable and food deficit villages within the district were selected purposively based on the food insecurity and poor socioeconomic condition. Hukam, Mahat and Chunbang are remote and not connected by the motorable roads. The first two are at higher altitude than other VDCs so differ significantly in crop production and productivity. There is limited climatic suitability for food crops and the maize and potato are the major staple food crops. These villages are dominated by Janajatis and followed by Chhetris in term of ethnicity. There is limited access to market from these villages and the usual means of transportation is on foot, by mule or horses and human back etc. Other three VDCs are connected to the motorable road but not year-round functional. Khalanga is the districts' headquarter, selected to make comparative study of different variables selected. Khara and Peepal are somehow near to Khalanga and have access to better market and have greater cropping intensity than rest of all. The last two are dominated by Chhetries and followed by the Janajatis and Dalits. These are better in health and school facilities and are just below than Khalanga, the DHQ.

Thus six Village Development Committees (VDCs) namely, Khara, Hukam, Mahat, Chunbang, Peepal and the district head quarter Khalanga were selected from Rukum

District on the basis of above criteria. In addition to this the study area was selected in such a way that these six VDCs represent the whole social and agro-ecological domain of the Rukum District having food insecurity as a critical issue. The map of Nepal showing the study district and map of Rukum District showing the study sites are presented in Figure 3.1.

Figure 3.1 Map of Rukum District showing colored, the sampled VDCs

3.1.2 Study Population, Sampling Size and Sampling Procedure

Sampling plays an important role in research. Without a sound sampling plan and a suitable sample size, the data will be collected from neither proper respondents nor the appropriate number of them (Tull and Hawkins, 2000). The sample size determination and sampling procedure used in this study is discussed below.

The study population was constituted by all the household of these VDCs. Each VDC is divided into several clusters based on ethnicity, family income, land holding, livestock holding, crop production and food sufficiency, access to food and market, and severity of food security. The clusters are selected randomly and proportional households inside the sampled cluster were selected using Equal Probability of Selection Method (EPSEM) (Carletto, 1999) to comprise a random sample of 1000 households. Representatives of 1000 households and 3 institutions were interviewed and 64 key informants in 10 focus group discussions were held for survey to get primary data (Table 3.1).

Table 3.1 Study population and sample size, and focus group detail

VDCs	Total households	Sampled Household	Total Clusters	Sampled cluster	Focus groups	Focus members
Khalanga	1770	340	18	6	3	20
Khara	898	175	9	3	2	13
Chunbang	536	100	5	2	1	6
Peepal	751	140	8	3	1	7
Mahat	882	170	9	3	2	12
Hukam	397	75	4	1	1	6
Total	5234	1000	53	18	10	64

Source: Field survey, 2009

3.2 Methods of Data Collection

Both the primary and secondary data were used. The pre-tested interview schedule was administered to the selected households to collect primary data. These data were supplemented by the information obtained through observation and focus group discussion with key informant for understanding socioeconomic status, land holding and crop pattern, livestock holding, shocks and natural hazards and location specific characteristics of the study site.

The secondary information were obtained through reviewing different publication mainly produced by United Nations, Food and Agriculture Organization (UN/FAO), World Food Program (WFP), German Development Agency (GTZ), United Nations Development Program (UNDP), United States of America International Development (USAID), United Missions to Nepal (UMN), Nepal Agricultural Research Council (NARC), Ministry of Agriculture and Cooperatives (MOAC), Central Bureau of Statistics (CBS), Central Library of Tribhuvan University (TU), Library of Institute of Agriculture and Animal Sciences (IAAS), District Agricultural Development Office (DADO), District Development Committee (DDC) and Village Development Committees (VDCs) of Rukum.

3.3 Survey design

3.3.1 Preliminary review and field visit

In this phase, the relevant literatures, courses and research methodological techniques were learned with relevance to the survey research for assessment of food security in Rukum District. Then after, a visit was conducted to Rukum to overview and observed the field situation. Accordingly, more generalized studies and broad discussion

were made for the preparation of household questionnaire, Institutional and focus group discussion.

3.3.2 Preparation of questionnaire and pre-testing of questionnaire

Three set of data collection instruments were prepared for the collection of primary data. First set includes household questionnaires, which was prepared to collect information from every respondent household head. The second set was for key informants for focus group discussion about food security and the third set was for the institutional discussion. A co-ordination scheme was prepared to identify variables and the interview schedule was prepared accordingly. The major variables included in interview schedule were household socio-economic characteristics, farm characteristics and production and marketing environment, major livelihood strategies, consumption pattern and dietary diversity, use of external inputs and management of resources, and access to food and support services. In this phase, a series of progressive discussions were also made with the experts to prepare the sets of questionnaire. The pre-testing of household questionnaire was carried out to five respondents in Rukum district in order to make necessary additions and exclusions from the set of questionnaire to get the information in a single effort.

3.3.3 Interview Schedule

Primary data were collected through household interview schedule and phone survey. The information on existing crop production system and information about the socioeconomic condition and behavioral variables of food security and natural resource management were collected. Information about household food consumption and dietary diversity were also collected from the households.

The field survey was conducted in summer of 2009 starting from 01 May to 30 July. The respondents were interviewed by visiting their homes. The interview timing was fixed as per the respondent's convenience. Regular checking and validation of the information was done immediately after filling the interview schedule. After that another visit was made in 15 November, 2009 for 5 days to monitor the change in situation in winter season. All the household heads were interviewed in the same manner. In addition to the household questionnaire, the households of the district headquarter Khalanga were surveyed by using telephone and the same interview schedule is used and data was collected similarly. Respondents were encouraged to report quantities using a variety of local measures, which were later translated into grams. Other household members,

especially those involved in agricultural production, were encouraged to participate during the interview and often served to refresh the memory of the principal respondent.

3.3.4 Focus group discussion

These surveys were the real exercise for collecting primary data. After completing the surveys, focus group discussions (FGD) were organized in each location provided to perform that in each VDCs. To assess the major problems of food security and attitude of the farmers towards the food security and natural resource management focused group discussion were conducted and for SWOT analysis, participatory approach (PA) was applied in all the VDCs. Main purpose of PA is to identify the major problems of the area regarding the food and resources, and response and attitudes of the users for consumption and conservation of food and natural resources. Special consideration was given to qualitative information generated informally during PA. These will involve the key informants (table 3.2), some of the respondents of the household surveys and other local members. In the FGD participants were local peoples (both male and female), ensuring the balanced and inclusive participation to collect the different information regarding to food availability, food access, food consumption and consistency of them. Focus group discussions were held in 10 different communities for gaining the realistic idea about the vulnerability and the effects of the food insecurity to the livelihood of local people. For this a total of about 64 key informants (belonging to different ethnicity, economic status, age and gender) from different physiographic and agro-ecological domains of selected VDCs had been selected for the face to face discussions. Similarly three institutions namely; United Nations, Food and Agricultural Organization (UN/FAO), District Agriculture Development Organization (DADO) and United Missions to Nepal (UMN) were selected for institutional discussion since these institutions were launching programs related to the food security and livelihood. The discussion was taken with the help of structured note for discussion and their views and information were recorded for study. The repeated interaction with the local people was done to overcome the short comings and unclear information about the incidence and vulnerability of food insecurity and livelihood strategies.

Table 3.2 Selection of key informants for Focus Group Discussion (FGD)

Socio-economic categories	No of interviews in each VDC										
	Khalanga			Khara		Chunbang	Peepal	Mahat		Hukam	Total
	1	2	3	1	2			1	2		10
Food sufficiency											
Food secure	4	2	4	1	1	1	2	1	1	2	19
Medium	2	3	1	3	2	3	2	1	2	1	20
Food insecure	1	1	2	2	4	2	3	4	3	3	25
Ethnicity											
Bahun/Chhetri	2	1	4	2	1	3	3	1	1	2	20
Janajati	3	3	2	2	3	2	2	3	4	3	27
Dalit	2	2	1	2	3	1	2	2	1	1	17
Gender											
Male	4	4	3	3	4	3	3	3	2	2	31
Female	3	2	4	3	3	3	4	3	4	4	33
Total	**7**	**6**	**7**	**6**	**7**	**6**	**7**	**6**	**6**	**6**	**64**

Source: Field survey, 2009

3.4 Operational definitions of terms

3.4.1 Dependent variables

Household Food insecurity

Food secure household refers the state of household being able to provide sufficient calorie required of all the household members. Those households having food sufficient to provide the calorie requirements of all household members are considered as the food secure households and if not, considered as food insecure household. For this study the household food insecurity was taken as the dependent variable. The calorie consumed can be calculated by the help of calorie conversion of major consumed food stuffs as appendix 1.

3.4.2 Independent variables

These are the socioeconomic and behavioral characteristics of respondents and have direct or indirect impacts over the food insecurity of the household.

Age

Age refers to the respondent's chronological age in years of his/her last birthday. The age of the respondents was classified into 3 groups: Young (<35), adult (36-55), and old (above 56).

Gender

Gender referred male and female the biological differentiation.

Ethnicity

Ethnicity refers to the caste of the respondents. Ethnicity was categorized into four groups: Bahun (Brahmin), Chhetri, Janajati (Magar, Tamang, Gurung) and Dalits or occupational caste (Kami, Damai, and Sarki).

Education level

Education attainment refers to the years that respondents spent for completing the formal Schooling. Educational attainment was classified into (1) Illiterate (the respondent who cannot read and write and not enrolled in school) (2) Literate only (the respondent who can read and write but not enrolled in school) (3) School education (the respondent who enrolled in school but not gone to college) (4) college education (the respondent attaining education more than SLC at college).

Family size

Family size arranged based on norms of family planning association of Nepal. Family size means the number of persons living together, sharing the house, keeping kitchen and eating arrangement in a given family. Families with four or less members were considered as small family. A family consisted with 5-8 members are considered as medium family, and one family who is composed of more than 8 members as large family.

Family type

Family type refers to the number of family member and generation determines family type. Family type was classified into 2 groups:

Nuclear family: Nuclear family refers to the Parents and their unmarried children living together under single roof.

Joint family: Joint family refers to the family of which has more than 3 generations such as Grandfather, Grandmother, Sons and Daughters, Grandsons and Granddaughters together under single roof etc.

Main occupation

Main occupation refers to the source of family income or way of earning by the respondent and his/her family members. The source of income was categorized into five groups: agriculture, service or pension, local business, abroad income and seasonal labor.

Farm size

Farm size refers to the area of land holding operating for cultivation by the respondents, either own, leased, or tenanted. The land holding were classified into 3

categories: landless or marginal farm who had less than 0.5 ha of land, small farm (0.6 to 2 ha) and medium and large farm who had more than 2 ha of land (Sharma, 1999).

Availability of irrigation

Availability of irrigation refers to the land type according to the availability of irrigation either by natural sources or from artificial means. It was categorized into two categories. The first was irrigated having year round irrigation available for total land of farmers and rainfed having irrigation not available at all.

Livestock holding

Livestock, in its generic sense, includes all farm animals and poultry. Since different livestock species were raised by the respondents, a common unit i.e. Livestock Standard Unit was used to convert all the livestock species in a single unit. The LSU was calculated by the following formula and classified into three categories: No livestock, small (1-5 livestock), and large (>5 livestock) (Adhikari, 2000).

$$LSU=1(cow/bull)+1.5(buffalo)+0.4(goat/sheep)+0.6(swine/pig)+0.2(poultry)$$

Food consumption pattern

The food consumption pattern means the total types and amounts of food consumed by the household members for one week. Then a particular pattern is found by differentiating the consumed food into 8 different food groups and then calculated the calorie consumed on the basis of calorie conversion table (Appendix 2).

Social participation

Social participation refers to the involvement of respondent in agricultural trainings and developmental activities as well as agricultural demonstration organized by different line agencies and agricultural institutions. Further it includes the members of farmers group, cooperatives and any social institutions. It was classified into four categories. The first was no participation category, those respondents having participated not in any types of agricultural trainings, demonstrations and even not been member of any farmer's group, cooperatives and any social institutions excluding members of political parties. The second category was trainings/demonstrations, those respondents having participated in one of the agricultural trainings and or any agricultural demonstrations. The third was group members, those respondents having membership of any farmer's group, cooperatives, and any social institutions excluding the political parties. Finally both categories had included those respondents having participated in the agricultural trainings and demonstrations (or if any of them) and membership of the farmer's group, cooperatives and any social institutions excluding the political parties.

3.5 Statistical measurement of the variables

3.5.1 Dependent variable
Household Food insecurity

The data about the amount of total food consumption of a household was collected from individual household questionnaire survey. Then the amount of calorie consumed was calculated with the help of calorie conversion table (appendix 1). Thus calculated calorie consumption was used to measure the state of food insecurity of the household on the borderline of 2344 kcal person^{-1} day^{-1} for Mountain/Hills of Nepal set by the NPC in 2003 based on WHO guidelines. The households consuming calorie more than 2344 kcal person per day were considered as the food secure households and provided 1 point and those consuming less than 2344 kcal person^{-1} day^{-1} are considered as food insecure household and provided 0 point. Thus, dependent variable was analyzed in regards with different independent variables using statistic of F test.

3.5.2 Independent variables
Age

The 3 groups of age of the respondents i.e. Young (<35), adult (36-55), and old (above 56) were provided 1, 2, and 3 respectively.

Gender

In case of gender, male were provided 1 point and female were provided 2 points.

Ethnicity

The Bahun, Chhetri, Janajati and Dalit castes were provided 1, 2, 3, and 4 point respectively.

Education/literacy level

The four groups of education/ literacy level were provided 1, 2. 3, and 4 points for Illiterate (the respondent who cannot read and write and not enrolled in school), Literate only (the respondent who can read and write but not enrolled in school), School education (the respondent who enrolled in school but not gone to college), and college education (the respondent attaining education more than SLC at college) respectively.

Family size

The small sized family was provided 1 point, the medium, 2 points and the large sized family was provided 3 points.

Family type

The nuclear family was provided 1 point and the joint family was provided 2 points.

Main occupation

The farmers having main occupation as agriculture, service or pension, local business, abroad income and seasonal labor were provided 1, 2, 3, 4, and 5 points respectively.

Farm size

The landless or marginal farm size, who had less than 0.5 ha of land was provided 1 point, small farm (0.6 to 2 ha) was provided 2 points and large farm who had more than 2 ha of land was provided 3 points.

Availability of irrigation

The irrigated lands were 2 points and the rainfed lands were provided 1 point

Livestock holding

The livestock holding, classified into three categories; No livestock, small (1-5 livestock), and large (>5 livestock) were provided 1, 2, and 3 points respectively.

Food consumption pattern

The households consuming more calorie than required (2344 kcal per person per day) were considered food secure household and provided 1 point and households consuming less calorie than required were considered the food insecure household and provided 0 points.

Social participation

Those respondents having zero participation were provided 1 points, those having trainings and or demonstrations were provided 2 points, those who are group members were provided 3 points and for respondents having dual participation(Both) were provided 4 points.

3.6 Methods and techniques of data analysis

The information collected from the field was coded first and entered into the computer. Descriptive statistics like frequencies, percentage and cross tabulations were used to describe socioeconomic and farm characteristics. Variables like the sex of household head, ethnicity, education, occupation, family size, landholding and income and food consumption inter alia were considered for the descriptive analysis. Food security analysis was made separately, which is discussed below under the subsection of food

insecurity analysis. Data entry and analysis was done by using computer software package, which are Statistical Package for Social Science (SPSS) and Microsoft Excel. All the inferences from the analyzed data were preceded in the dissertation as the original research. For data analysis, percentage and frequency analysis, cross tabulation, linear regression and F test of probability were used.

3.6.1 Analysis of food insecurity

We can mark that the concept of food security has been narrowed down from the global context to household. Household can be defined as a group of people who normally live ad eat their meals together. Here 'normally' means that the person concerned has lived in the household for at least six of the past twelve months. Household can be defined as "co-residential unit, usually family based in some way, which takes care of resource management and primary needs of its members". Kinship, residence, and resource management for primary needs are the three important elements of the definition (Rudie, 1995). Provision of food is the most important primary need and thus remains the core task of households (Balatibat, 2004). Therefore, household, as a unit of analysis, offers some distinctive advantages over larger units of analysis, especially in the rural setting where households are the primary unit of production, consumption and exchange (Sandoval, Larona, and Puerto, 1987). The IFPRI also recognized the calorie acquisition as an important outcome measure of food security at household level (Hoddintt, 1999).

The concept of enough food though has some criticisms, it appears to make sense to concentrate initially on calories, to define needs not just for survival, but also for "an active, healthy life", to assess not just the fact of shortfall but also its gravity, and to begin with individual needs and build up to the household. Therefore, measurement of the household food consumption is the most common indicator of food security (Bouis, 1993; Maxwell and Frankenberger, 1992). This requires data on household food consumption, household size, and age and sex of individuals, which help to assess the calorie consumed by the household for the given year and the calorie requirement of the household for the given period (Maxwell, 1999). This is simply application of the concept of calorie in the household, and the difference between total calorie consumption, and the requirement for the given period reflects the food security situation of the household for the given period.

Total calorie consumption of a household was calculated through the calorie conversion of major food items consumed by the sampled households (Appendix 1). Mainly, 44 food items were reported to be consumed by the respondents in the study area.

Total consumption of food items includes the consumption from self production, purchased, received as payment, and exchange. To calculate calorie requirement of a household, the norm of 2344 kcal per person per day of calorie requirement for Mountain/Hills of Nepal set by the NPC based on WHO guidelines was considered. Based on the adjusted family size in terms of adult equivalent (Appendix 2), total calorie requirement of the household was calculated. Therefore, based on the total calorie consumption and the total calorie requirement of sample households, main three measures of food insecurity namely; food insecurity incidence (head count index-equation 1), food insecurity gap index (equation 2), and food insecurity severity index (equation 3) were calculated. The following formulae were used to calculate each of the three food insecurity measures (Manandhar, 2003; cited from Joshi, 2008).

$$FII = \frac{FIH}{TH} \times 100 \dots\dots\dots\dots\dots\dots 1$$

$$FIGI = \frac{1}{n} \sum_{i=1}^{n} \left[\frac{TCR_i - TCC_i}{TCR_i} \right] \times 100 \dots\dots\dots\dots 2$$

$$FISI = \frac{1}{n} \sum_{i=1}^{q-n} \left[\frac{TCR_i - TCC_i}{TCR_i} \right]^2 \times 100 \dots\dots\dots\dots\dots 3$$

Where, FII = Food insecurity index

FIH = Food insecure households (n)

TH = Total sample households

FIGI = Food insecurity gap index

TCR_i = Total calorie requirement of ith household

TCC_i = Total calorie consumption of ith household

FISI = Food insecurity severity index

Interpretation of all the three measures of food insecurity can be made accordingly to above equations. Headcount index (incidence) is the proportion of the population suffering food insecurity. However, this measure is indifferent as to whether food insecure households have consumption level just below standard calorie requirement or they lie far below standard calorie requirement. The second measure, gap index, provides information regarding how far off food insecure households are from the standard calorie requirement, thus, goes some way towards addressing problem of headcount index. This measure calculates the distance between consumption levels of the food insecure household and standard calorie requirement; the greater the distance (value moving close to 1 or 100

percent) higher will be the gap. The distance is the total resources needed to bring the entire food insecure household to the consumption level of the standard calorie requirement. In this way, the food insecurity gap can be used as a measure of the minimum amount of resources necessary to eradicate food insecurity or the amount that one would have to transfer to the food insecure household under perfect targeting to bring them all out of food insecurity. The squared gap index (severity index) is similar in construction to the gap index but it applies an increasing weight to greater distances below standard calorie requirement. In other words, it takes into account the inequality among the food insecure households. The severity index is thus particularly sensitive to the severity of food insecurity, and a higher weight is placed on those households who are further away from the standard calorie requirement (Joshi, 2008). Higher the value of the squared gap index (i.e., moving towards 1 or 100 percent) more severe will be the food insecurity.

4 DESCRIPTION OF STUDY AREA

4.1 Geographical setting

Rukum district, the district purposively selected for the study, falls under the Mid-Western Hills of Nepal. This is the remote district of Northern Rapti zone with rugged terrain. Geographically the district is situated in $28^0 29'$ to $29^0 0'$ North Latitude and $82^0 12'$ to $82^0 53'$ Eastern Longitude. The district is surrounded by Dolpa in the north, Salyan and Rolpa in the south, Baglung and Myagdi in the east, and Jajarkot in the west. Altitudinal range of the district varies from 754m amsl to 5841m amsl, however the district headquarter (DHQ) Khalanga is in height of 1448m amsl. This district is spread within the geographical area of 2877 square KM. The district is divided into 43 VDCs. There are 33545 households, with the average family size of 5.61, residing in the district. Therefore, the district has the total population of 188,438 which is growing at the rate of 1.88 percent per year. The climate of this district is diversified according to the altitude having the subtropical, sub-temperate and temperate climates. The average annual rainfall is about 1600 to 2400 mm. The average minimum temperature is 0.4^0C and the maximum average temperature is 24^0C.

4.2 Natural resources and environments

Total land of this district is 293182 hectares among which only 35358.6 ha land is suitable for agriculture i.e. 12.06 percent of land is cultivable. Besides these 167856 ha is covered with the forest land, 214.4 ha residential land, 1079.5 ha snow covered land, 59205 ha pasture and grazing land, 30548 ha covered with rugged stone and steep slopes. There is only 27480 ha land utilized for the agricultural purpose which is 77.7 percent of the arable land. The agricultural land is predominantly the Rainfed Upland comprising 90 percent that is 24719.5 ha, followed by the lowland 2760.51 ha (10 percent). The total irrigated land of this district is 5118 ha which is 18.62 percent of the total agricultural land and divided further into two categories, year round irrigated 2800 ha (54.7 percent) and seasonal irrigated 2318 ha (45.3 percent) (DDC, 2005). The district is also prone to natural disasters such as landslide, epidemics, natural famine, drought and hailstone together with the crop damage caused by the attack of wild animals (wild boar, monkey, porcupine, and etc). Not only this, the decade long had internal conflict hit hard in its further development and agricultural advancement. Therefore, the district falls under the category of food deficit districts having total food deficit of 816 metric ton (CBS, 2002).

4.3 Economic and social settings

The socio-economic features of the Rukum district includes primitive economic activities with a few fundamental infrastructures, seasonal road accessibility, rainfed and traditional agricultural cultivation practices, marginal and poor ethnic community with remarkably low level of literacy. This district is dominated by Chhetri (58.41 percent) followed by Magar ethnic group (23.15 percent) but the Thakuri (5.08 percent), Dalits/Occupational caste (3.98percent) and Bahun (3.44 percent) are other prevailing caste groups in the district (CBS, 2005; DDC, 2005). Most of the people are Hindu by religion that is 98.2 percent followed by Buddhist 0.93 percent. The population density in the district in terms of total land area is 0.65 persons per hectare (CBS, 2005). However, at the same time, it also has the higher proportion of households i.e., 81.54 percent households, adopting agriculture as the main source of livelihood. This led to quite high population density in terms of cultivated land, i.e., 12.14 persons per hectare (CBS, 2007).

Table 4.1 Crop production in Rukum district

S.N.	Crops	Area (ha)	Production (Mt)
1	Rice	3579	8617
2	Maize	18650	31520
3	Wheat	11875	17100
4	Millet	1140	1504
5	Barley	960	1238
6	Potato	1580	13430

Source: CBS, 2005

The major crops cultivated are maize, wheat, millet, barley, potato, beans and onion along with some vegetables and locally available temperate fruits. But the dominating cropping pattern was the maize+wheat system using traditional cultivation practices. The livestock were especially the cows, bullocks, pigs, goats and chickens for their household consumption. The status of crop production and livestock holding is given in table 4.1. The agriculture is mostly rain fed having only 32.16 percent of total arable land irrigated by diverting the river temporarily. Being a hilly district, there is land degradation problems, especially soil erosion and nutrient depletion in agricultural lands. This has direct impact on the agriculture production decline. The area had abundant natural resources and vast biodiversity, but it is in declining stage.

Almost all the household is headed by the male member either it be the father or son symbolized that domination of patriarchal social setting. The majority of the families are of nuclear type comprising 73.9 percent. About 50 percent of houses have thatch roof

followed by almost 35 percent of houses have slate and wooden planks. Illiteracy rate in this district is about 60 percent, which is significantly higher than that of national figure 45.9 percent of illiteracy (CBS, 2005). Rukum is one of the food deficit district having 44 percent of people have food deficit for 6 months or and more.

4.4 Infrastructure facilities

Compared to other parts of the Mid Western Hilly region, Rukum District is relatively less accessible to transportation network and market centers. Markets, hospitals, and educational centers are not within assessable distance and the transportation facilities are not easily available. Musikot-Khalanga, Jhulneta, Dumai, Khaula, Chaurjahari are the main market centers of the district. It has two airports Chaurjahari and Musikot-Khalanga and one motorable (only functional in dry seasons and not graveled yet) road connected to Tulsipur, Dang from district headquarter Musikot-Khalanga.

The district, being far away from the capital and other major cities of the country, has not received small portion share of attention in the development process and governance until very recently. This limits the availability of modern amenities like motorable road, education, health, credit, safe drinking water, electricity, and telecommunication to vast majority of its population. Around 91 percent of its population resides in rural areas devoid of all modern amenities (DDC, 2006). With this the district, having HDI of 0.386, falls under the category of the districts with very low HDI (NHDR, 2004). The condition of the district in terms of incidence of chronic malnutrition among children under five years of age is also severe. Around 61 percent of children fewer than five years of age are suffering chronic malnutrition (UNDP, 2004). The ratio of people per health institutions of Rukum is 4,283 indicating poor health facilities. Similarly, there are only 276 schools available with 1202 teachers for 50347 students indicating poor educational facilities (CBS, 2005).

5 RESULT AND DISCUSSION

5.1 Brief introduction of the study area

Six VDCs of Rukum district are selected for the study purpose. These villages are remote and have severity of food security. Among six, three have access to motorable road, however road facility is recent and poorly managed and other three have no access to motorable road. Hukam is the farthest VDC selected having no nearby market. The people of Hukam have to travel for 42.3 KM on foot for 2 days for nearby market. Khalanga is the District headquarter and have facility of market, however the market is small and developing. Other four villages have similar distances to market, forest, river and border of India with slight differences of some indices (table 5.1).

Table 5.1 Approximate distances from nearby market (Km), forest (Km), river (Km) and border (Days) and the transportation means of sampled VDCs at Rukum.

SN	VDC	Market	Forest	River	Border	Transportation Means
1	Khara	3.0	3.4	3.3	2	Bus, Tractor
2	Hukam	42.3	0.1	0.1	4	Mule, Horses, Human back
3	Mahat	2.9	1.5	1.4	3	Mule, Horses, Human back
4	Peepal	2.7	1.5	1.6	2	Small Jeep, Tractor
5	Chunbang	2.8	1.0	1.0	3	Mule, Horses, Human back
6	Khalanga	0.5	2.5	1.3	2	Bus, Tractor
Average Distance		**9.0**	**1.7**	**1.4**	**3**	

Source: Field Survey, 2009
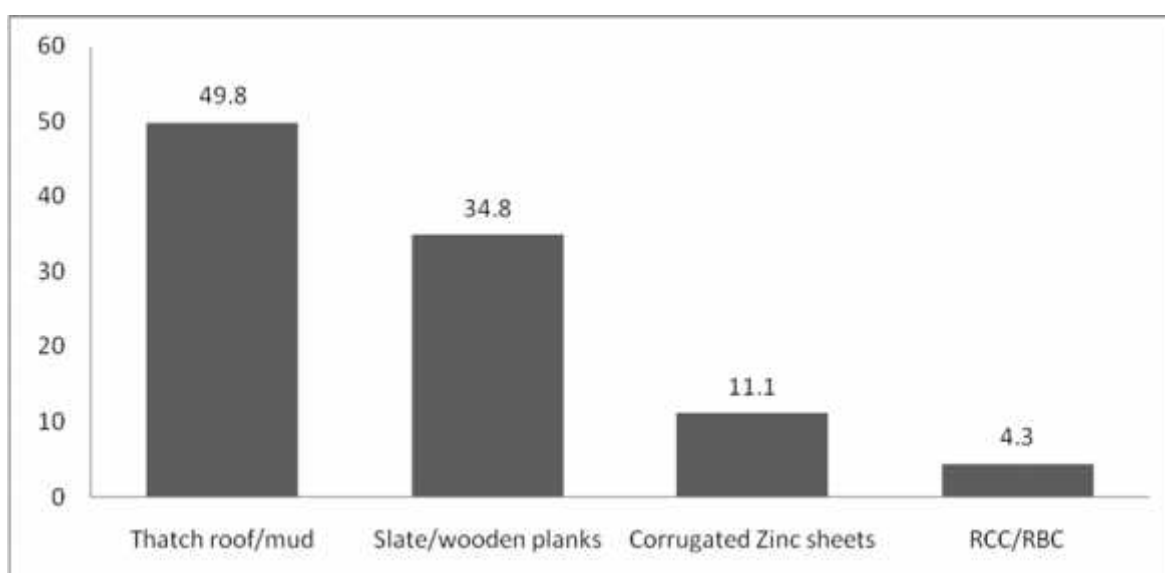
Figure 5.1 Roofing materials of houses in Rukum, Source: Field Survey, 2009

The district is one of the poor districts of the mid western hills of Nepal. Almost all households are farmers and have limited affordability to well built houses. They have

houses made by locally available resources like the thatch grass, stone slates, wooden planks and locally available furniture. The rich people only have constructed houses with corrugated zinc sheets and cemented houses with RCC/RBC ceilings. The distribution of houses according to the roofing materials is given in figure 5.1. Majority of houses (49.8 percent) are made of thatch roof which are basically poor and marginal farmers, especially Dalits and Janajatis. Almost 35 percent of houses are made of stone slate or wooden planks which are mainly of small sized landholders. The remaining 15 percent of houses are made of either corrugated zinc sheets or RCC/RBC ceilings. These are mainly of large sized landholders, service or salaried job holders.

Almost all sampled population has the agriculture as the main occupation and they have cultivated their land themselves. Only 13.1 percent of people have rented out their lands in Rukum according to the National Sample Census of Agriculture, Nepal by CBS in 2002. The major cropping pattern of this district is the maize + wheat system having 43 percent share, followed by rice + maize system (33 percent) showing the maize is the dominating crop all over the district. Only 20 percent have adopted the rice + wheat system which is the main cropping pattern of Nepal (figure 5.2).
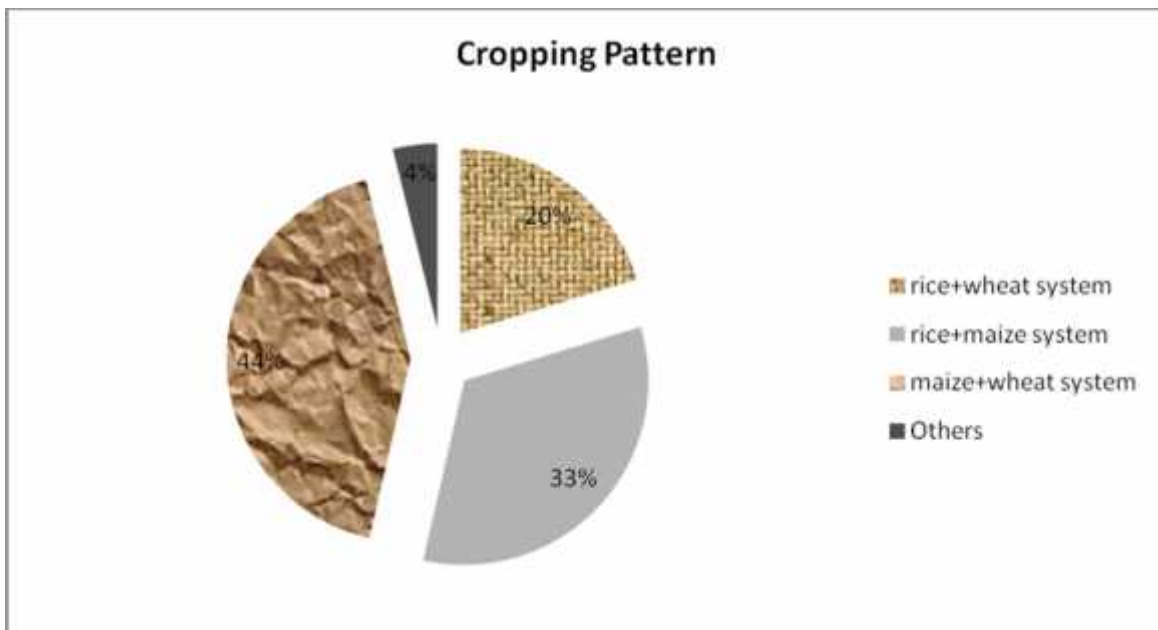
Figure 5.2 Cropping pattern of Rukum District, Source: Field Survey, 2009

However the cropping intensity is not satisfactory in this district. The usual practice of this district is to cultivate one (8.7 percent) or one-two crops (66.2 percent) annually in one field (table 5.2). That may be due to low knowledge about modern cultivation practices or unavailability of agricultural inputs and technologies. That restricted the cropping intensity in between 1 and 2, which is almost 75 percent. Only 24.2

percent farmers have properly utilized their lands by cultivating more than two crops annually in the same field. The overall cropping intensity of Rukum district is 1.75 which is slightly smaller than the national figure of Hills of Nepal (1.82).

Table 5.2 Cropping intensity of Rukum District

S.N.	Cropping intensity	Percent
1	No crops	1.0
2	Less than 1	8.7
3	1-2	66.2
4	More than 2	24.2
Total		**100.0**

Source: Field Survey, 2009

The main staple food is maize (53.6 percent) followed by rice (44.9 percent).There is limited knowledge about the nutritional values of vegetables; therefore the cultivation of vegetables is not significant. A considerable percentage of people have no idea about the kitchen gardening, however 62.8 percent households have maintained the kitchengarden nearby their residence (figure5.3).
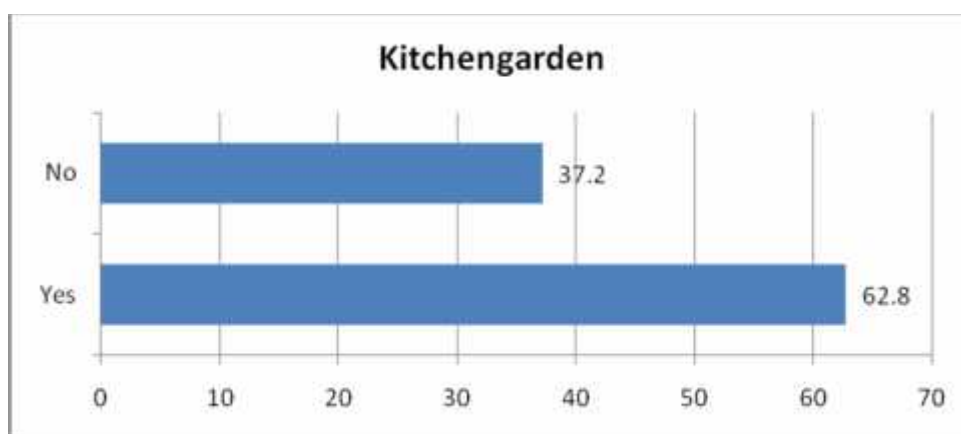
Figure 5.3 Kitchengarden Holding population in Rukum; Source: Field survey, 2009

Table 5.3 Livestock holding in Rukum District

S.N.	Livestock Unit	Percent
1	No livestock	5.8
2	Small (1-5 LSU)	25.1
3	Large (>5 LSU)	69.1
Total		**100.0**

Source: Field Survey, 2009

The practice of livestock holding is usual and significantly adopted (table 5.3). Only 5.8 percent households, especially lived near the market and in district headquarter, have reared no livestock. Almost 94 percent households have kept livestock among which

69.1 percent have large unit of livestock (more than 5 LSU), where LSU= 1 (Cattle) +1.5 (Buffalo) + 0.4 (Goat/Sheep) + 0.6 (Pigs) +0.2 (Fowls) as given by Adhikari, 2000.

5.2 Major agricultural hazards

Agriculture is the dominating source of livelihood of the sampled household. Various factors cause the decline in agricultural production in recent years in Rukum. Major factors that cause the reduction in agricultural production are shown in table 5. The major two causes reported by 76 percent of households are the draught (44.7 percent) and the crop diseases (31.1 percent) that are responsible for the reduction. The natural shocks are the major constrains for the agricultural development since that was reported by 75.4 percent of study population. There is small fraction of human and other shocks (economic, social etc) reported by 5.3 percent of households, however about 20 percent have not experienced any type of shocks recently. The occurrences of different natural shocks are reported as in table 5.4.

Table 5.4 Major agricultural hazards/natural shocks in Rukum District

S.N.	Causes	Percentage
1	Draught	44.67
2	Crop diseases	31.1
3	Hailstone	7.77
4	Hurricane	0.97
5	Landslide	3.88
6	Excess rain	1.94
7	Icefall	6.79
8	Others	2.91

Source: Field Survey, 2009

5.3 Major Constrain of food security and livelihood

The study population have reported 21 constrains of livelihood. These are summarized in table 5.5 below. Among these constrains the major five are the road and transportation (14 percent), irrigation facilities (10.5 percent), agricultural inputs availability (9 percent), agricultural training and extension (7.5 percent) and health and education facilities (7.5 percent).

Similarly the ten years long civil war had hit this district roughly and makes the agricultural as well as socioeconomic stability fragile. In Rukum, the conflict affected population is reported as 34.3 percent comprising the death 3.9 percent, disabled 5.3 percent and displaced 25.1 percent of sampled population as in table 4.1. This conflict has

tremendous negative impacts for the agricultural and economical developments so are directly related to the food insecurity of that locality. Not only this conflict had damaged the infrastructures and the socioeconomic structures that result the decline in production, marketing and procuring.
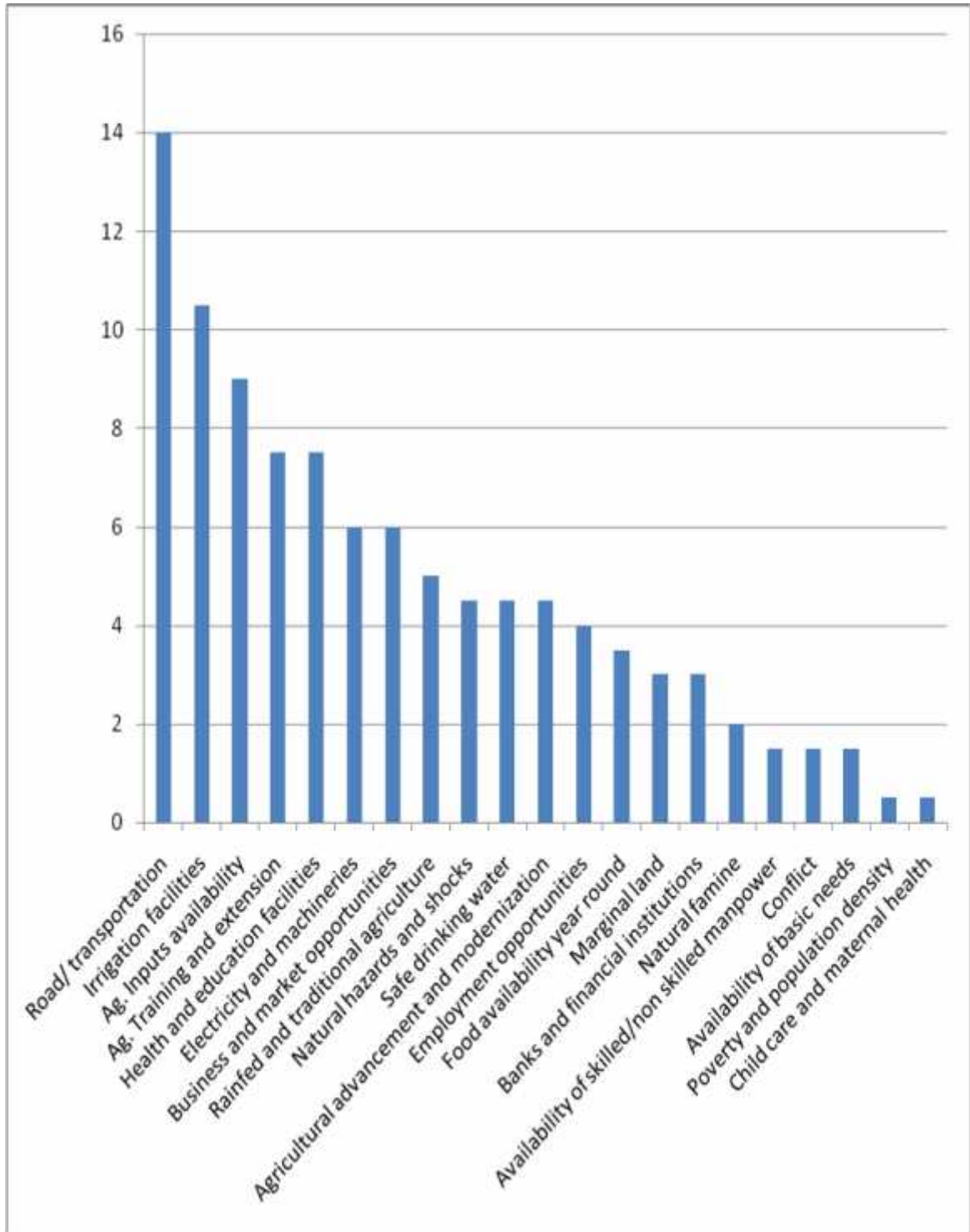
Figure 5.4 Major Constrains of Food Security and Livelihood in Rukum District
Source: Field Survey, 2009

5.4 Household socioeconomic characteristics

It includes the analysis of the characteristics of study population on the basis of age, gender, ethnicity, educational level or literacy rate, adult equivalent family size, land holding (farm size), source of family income (main occupation) and social participation of the household (table 5.6). The major basis of such information is the primary data collected from the household head. The household head refers to the person who was acknowledged as head by other members of the household. It is the general trend that the household head holds the resources and the decision making power of the household. However in most of the cases, female household head do not have such privilege due to the patriarchal nature of the Nepalese society. But almost every agricultural activity is to be accomplished by the female member of the household and the food acquisition and holding is regarded as the main duties and responsibilities of them. Proportion of the female headed household in the study area is 16.4 percent which is slightly greater than the national figure of 14.9 percent (UNFP, 2002) and smaller than that of mid western 19.39 percent (CBS 2002). The proportion is highest in Mahat, 25 percent followed by Chunbang and remaining similar to national figure in all other VDCs except in Khara where the ratio is only 7.5 female per 100 male.

The main age composition of the population is the adult, 56 percent, having age in between 35 to 55 years old, nearly similar to the national figure of 52.54 percent and the district figure of 59.61 percent according to the National Sample Census of Agriculture, Nepal by CBS in 2002. This age group is followed by the old (age more than 56 years), 24.6 percent and finally the young (age less than 35 years) age group of household has a portion of 19.4 percent. The distribution differs remarkably in all VDCs. The adult have highest proportion in Khalanga, the old in Peepal and the young has their highest share in Mahat remaining the adult at top at all places.

Caste wise, distribution of the sample household shows that the Janajati (36.7 percent) and the Chhetri (35.7 percent) are dominating caste group. Households in Peepal, Mahat and Chunbang are dominated by Janajati while in Khara, Hukam and Khalanga by Chhetri. The two caste group comprises 72.4 percent of total population of studied sample. Illiteracy of household heads is quite prevalent in almost all VDCs. The overall illiteracy of household head is 52.7 percent which is similar to the national figure of 52.5 percent (CBS 2002). This distribution is having minimum 40.6 percent in Mahat to maximum 64.5 percent in Hukam. The population achieving the college education is very small and limited to 9.7 percent. The highest college educated households (20 percent) are in Khara

where the literacy rate is 55 percent, followed by Mahat (15.6 percent). The overall distribution of the educated population is significantly different among the six VDCs. In case of family size, 65.2 percent of household come under the medium, household having more than 5 to 8 members followed by small (26.6 percent) and large (8.2 percent). There is same composition of age group within the VDCs along with significant variations in group percentage in the sampled population.

Agriculture is the most dominating occupation and the source of family income in the district. Almost 53 percent of the households have the agriculture as their main source of earning and living. The proportion is similar in all studied areas. The agriculture is followed by the service or salaried jobs (26.6 percent). The distribution of service or salaried jobs in different VDCs differs significantly. A small portion of the population (11.1 percent) sustain with local business and the traditional skills. Furthermore, there is remarkable portion of seasonal labour (4.3 percent) and remittances (4.8 percent) as the source of family income.

The majority of the population (59.4 percent) possessed land of small size (0.5 to 2 ha). The small landholders is followed by the landless or marginal landholding households (32.9 percent) and the large farm owner having land more than 2 ha are the nominal, only 7.7 percent of total sampled population. The trend is similar to all the studied area except in Hukam the small landholders (45.2 percent) are dominated by the landless or marginal landholders (54.8 percent). In overall condition, the highest landless or marginal landholders in Hukam 54.8 percent, while the highest small landholders are in Chunbang 70.6 percent, and the highest large landholders in Khalanga 23.7 percent of respective total VDC population. Around 8 percent household heads are socially most active in the district, taken participation in the trainings, demonstrations and have been the members of farmers group or cooperative or any social institutions. A large population (60.4 percent) has no participation in agricultural trainings and demonstrations as well as is devoid of being member of any farmer group or social institutions. About 22 percent of household have attained at least one of such opportunities. This distribution is significantly different in the VDCs level however the overall trend of social exposure and participation is similar to that of district.

Table 5.5 Descriptive analysis of the household socioeconomic condition of Rukum

Variables	Khara	Peepal	Mahat	Chunbang	Hukam	Khalanga	Total
Sex							
Male	162(92.5)	118(84.4)	128(75.0)	79(79.4)	63(83.9)	286(84.2)	836(83.6)
Female	13(7.5)	22(15.6)	43(25.0)	21(20.6)	12(16.1)	54(15.8)	164(16.4)
Age							
Young(35)	13(7.5)	8(6.2)	58(34.4)	18(17.6)	29(38.7)	54(15.8)	194(19.4)
Adult	105(60.0)	66(46.9)	96(56.2)	44(44.1)	36(48.4)	259(76.3)	560(56)
Old (>56 yrs.)	57(32.5)	66(46.9)	16(9.4)	38(38.2)	10(12.9)	27(7.9)	246(24.6)
Ethnicity							
Bahun	35(20.0)	22(15.6)	5(3.1)	3(2.9)	2(3.2)	27(7.9)	92(9.2)
Chhetri	70(40.0)	35(25.0)	64(37.5)	32(32.4)	27(35.5)	152(44.7)	367(35.7)
Janajati	26(15.0)	83(59.4)	74(43.8)	59(59.0)	24(32.3)	54(15.8)	357(36.7)
Dalits	44(25.0)	0(0)	27(15.6)	6(5.9)	22(29.0)	107(31.6)	184(18.4)
Literacy rate							
Illiterate	79(45.0)	83(59.4)	69(40.6)	47(47.1)	48(64.5)	206(60.5)	527(52.7)
Literate only	17(10.0)	22(15.6)	11(6.2)	23(23.4)	7(9.7)	27(7.9)	121(12.1)
School education	44(25.0)	31(21.9)	64(37.5)	24(23.6)	17(22.6)	81(23.7)	256(25.6)
College education	35(20.0)	4(3.1)	27(15.6)	6(5.9)	2(3.2)	27(7.9)	97(9.7)
Family Size (Adult equivalent)							
Small (4)	35(20.0)	22(15.6)	69(40.6)	23(23.4)	19(25.8)	116(34.2)	266(26.6)
Medium	127(72.5)	101(71.9)	80(46.9)	68(67.7)	51(67.7)	215(63.2)	652(65.2)
Large (>8)	13(7.5)	17(12.5)	21(12.5)	9(8.9)	5(6.5)	9(2.6)	82(8.2)
Source of family income							
Agriculture	83(47.5)	79(56.2)	69(40.6)	65(64.7)	46(61.3)	170(50.0)	531(53.1)
Service/Pension	61(35.0)	44(31.2)	74(43.8)	18(17.6)	7(9.7)	72(21.1)	266(26.6)
Local Business	18(10.0)	4(3.1)	5(3.1)	9(8.8)	17(22.6)	63(18.4)	111(11.1)
Remittance	9(5.0)	9(6.2)	11(6.2)	9(8.8)	0(0)	9(2.6)	48(4.8)
Seasonal Labor	4(2.5)	4(3.1)	11(6.2)	0(0)	5(6.5)	27(7.9)	43(4.3)
Land category							
Landless/marginal	39(22.5)	39(28.1)	69(40.6)	29(29.4)	41(54.8)	89(26.3)	329(32.9)
Small	123(70.0)	97(68.8)	85(50.0)	71(70.6)	34(45.2)	170(50.0)	594(59.4)
Large	13(7.5)	4(3.1)	16(9.4)	0(0)	0(0)	81(23.7)	77(7.7)
Social participation							
No	70(40.0)	79(56.2)	111(65.6)	59(58.8)	56(74.2)	241(71.1)	604(60.4)
Tr. / Ag. Demo.	22(12.5)	9(6.2)	16(9.4)	12(11.8)	12(16.1)	45(13.2)	116(11.6)
Group members	52(30.0)	48(34.4)	16(9.4)	23(23.5)	5(6.5)	54(15.8)	203(20.3)
Both(T/D & GM)	31(17.5)	4(3.1)	27(15.6)	6(5.9)	2(3.2)	0(0)	77(7.7)

Source: Field Survey, 2009,

Note: Figures in parenthesis indicate percentage

5.5 Food security analysis

For food security analysis, this section describes the incidence, depth and severity of food insecurity in the study area and provides the information about the distribution of the households based on different socio-behavioural drivers of food security.

5.5.1 Food Insecurity Incidence (FII)

The incidence of food insecurity is higher in the studied areas. The most vulnerable is the Peepal VDC having more than 90 percent people food insecure. The incidence of food insecurity is similar in all area and the overall condition is also awesome because a huge percentage of people i.e. 83 percent of the studied population are consuming less food than required (i.e. 2344 kcal/person/day) given by figure 5.4.

There is high incidence of food insecurity in study areas. Almost 83 percent of population is consuming lesser calories than required (2344 kcal/person/day as recommended requirement for Mountain/Hills of Nepal set by the NPC based on WHO guidelines) which is fairly large than the 66 percent of national figure of food shortage. The food insecurity index differs significantly for the different clusters. It is also imperative in comparison with different socio-behavioural variables as given by table 5.7 below.
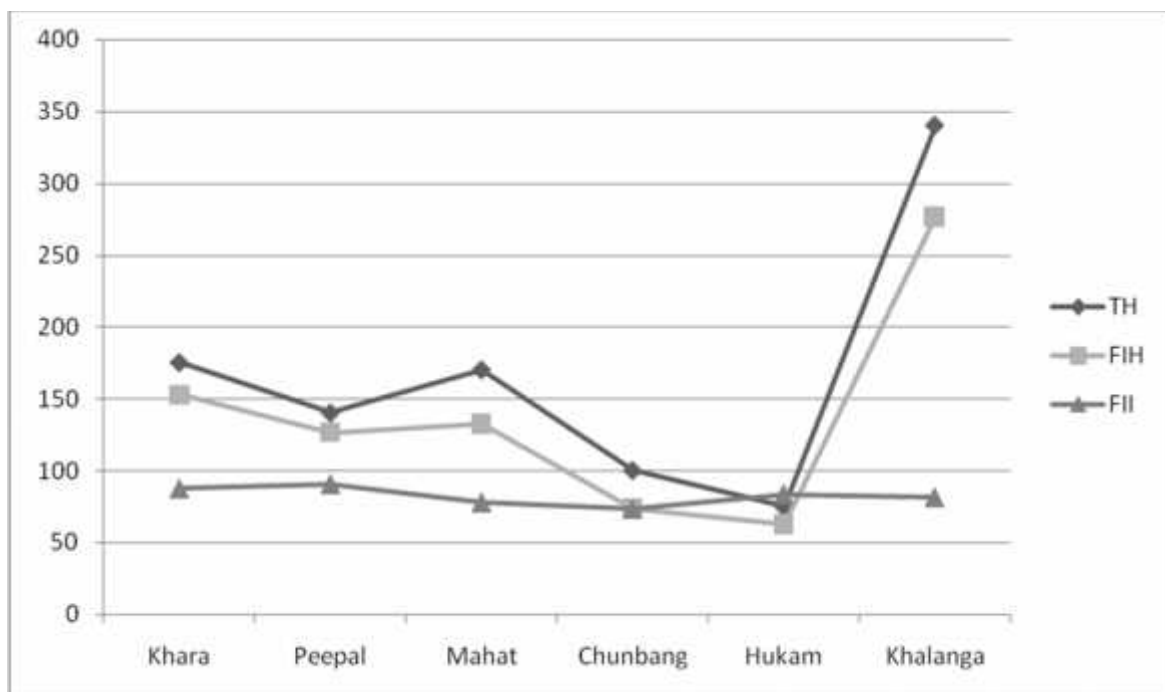
Figure 5.5 Food Insecurity Incidence of Rukum district

Source: Field survey, 2009

Table 5.6 FII with different socio-behavioural drivers of food security of Rukum

Variables	Khara	Peepal	Mahat	Chunbang	Hukam	Khalanga	Total
Sex							
Male	86.8	88.9	79.2	70.4	84.6	84.4	82.7
Female	100.0	100.0	75.0	85.7	80.0	66.7	82.4
Ethnicity							
Bahun	62.5	100.0	100.0	100.0	100.0	66.7	78.9
Chhetri	87.5	87.5	75.0	50.0	81.8	82.4	77.6
Janajati	100.0	86.7	71.4	84.2	80.0	50.0	80.0
Dalits	100.0	100.0	100.0	100.0	88.9	100.0	97.6
Literacy							
Illiterate	94.4	89.5	76.9	62.5	75.0	82.6	80.7
Literate only	50.0	80.0	50.0	87.5	100.0	66.7	76.0
School Education	80.0	100.0	75.0	75.0	100.0	77.8	83.0
College Education	86.2	91.3	73.3	65.2	81.0	87.5	81.5
Family size							
Small	100.0	100.0	75.0	87.5	87.5	69.2	85.5
Medium	86.2	91.3	73.3	65.2	81.0	87.5	81.5
Large	66.7	75.0	75.0	100.0	100.0	100.0	82.4
Source of Income							
Agriculture	84.2	94.4	61.5	70.0	73.7	68.4	75.9
Service/Salaried jobs	85.7	80.0	85.7	66.7	100.0	100.0	85.5
Local Business	100.0	100.0	100.0	100.0	100.0	85.7	95.7
Remittances	100.0	100.0	100.0	66.7	-	100.0	90.0
Seasonal labour	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Land category							
Landless/Marginal	88.9	100.0	92.9	90.0	94.1	100.0	94.1
Small	92.9	86.4	66.7	71.4	80.0	78.9	81.0
Large	33.3	75.2	66.7	33.3	50.0	66.7	56.5
Social participation							
No	92.9	88.9	81.0	70.0	82.6	88.9	100.0
Training/Demonstration	94.4	100.0	66.7	75.0	80.0	80.0	94.1
Group member	100.0	90.9	100.0	75.0	100.0	50.0	81.0
Both(T/D & GM)	86.4	100.0	60.0	100.0	100.0	-	56.5

Source: Field survey, 2009

Female household heads are completely food insecure in both Khara and Peepal VDCs and highly food insecure in all areas, but in overall the male and female household heads are similarly affected by the incidence of food insecurity. Caste wise the household heads of Dalits and occupational caste are mostly suffered from food insecurity having the figure of 97.6 percent of total Dalits. Dalits are followed by Janajati (80 percent). The Bahun and Chhetri are least suffered in comparison with previous caste group but the

incidence level is still high (78.9 for Bahun and 77.6 percent for Chhetri). Educational level have no significant different in the incidence of food insecurity. Around 80 percent of households of each educational level are food insecure in which the literate only are least suffered (76 percent) and the school educated are most suffered (83 percent).

In case of family size the small family sized households have least incidence of food insecurity (81.5 percent) followed by the large (82.4 percent) and finally the small family sized households are most insecure (85.5 percent) in terms of food insecurity incidence. The least food insecure (75.9 percent) is the agriculture based households heads while the household having the seasonal labour as main source of family income are the most vulnerable (100 percent) to the incidence of food insecurity. The seasonal labour category is followed by the local business (95.7 percent) and remittance categories (90 percent) in terms of incidence of food insecurity. The distribution within the VDCs is similar to total but there are significant differences among the VDCs. The food insecurity incidence is highest (94.1 percent) in landless or marginal land holders which is nearly double than that of large land holders (56.4 percent). All the not participants in the social activities and agricultural developments are food insecure (100 percent) in terms of incidence of food insecurity and in contrast to that, the participants in both the trainings or demonstration and the group or social institution members are least food insecure(56.5 percent).

5.5.2 Food Insecurity Gap Index (FIGI)

The FIGI measures the depth of the food insecurity and thus the level of food security in turn and its interaction with different socioeconomic and behavioural drivers of food security is given in table 5.8. The female headed households are suffered from more depth of food insecurity. That is significant statically in Khara, Hukam and Khalanga VDCs. Comparatively; the Dalits (11.74 percent) are more suffered since they have poor access to land resources and have little and marginal agricultural inputs. The illiterate have the highest value of depth of food insecurity (9.48 percent) followed by literate only (7.44 percent) and the least share is of the college educated households head (4.06 percent). The literacy rate is significantly applicable in the measurement of depth of food insecurity.

Table 5.7 FIGI with different socio-behavioural drivers of food security of Rukum

Variables	Khara	Peepal	Mahat	Chunbang	Hukam	Khalanga	Total
Sex							
Male	4.94	6.06	6.49	4.57	6.76	9.73	6.47
Female	7.69	5.57	4.46	7.30	11.58	14.16	8.08
P - value	0.08*	0.17	0.16	0.43	0.04**	0.10*	0.19
Ethnicity							
Bahun	1.63	10.43	0.17	1.02	31.83	6.04	6.82
Chhetri	4.54	3.87	7.66	1.93	3.53	7.87	5.11
Janajati	7.35	5.16	6.05	6.97	4.33	2.05	4.98
Dalits	17.62	7.74	2.91	8.92	13.29	14.33	11.74
P - value	0.04**	0.19	0.20	0.18	0.09*	0.07*	0.13
Literacy							
Illiterate	7.21	5.07	14.75	5.99	9.02	10.36	9.48
Literate only	12.78	6.94	12.67	3.75	7.21	4.08	7.44
School Education	3.17	6.49	4.71	7.10	4.53	6.16	5.49
College Education	2.63	6.39	3.30	4.75	3.05	4.43	4.06
P - value	0.58	0.07*	0.09*	0.90	0.05**	0.03**	0.06*
Family size							
Small	4.58	7.15	5.15	3.88	6.45	10.83	10.75
Medium	5.25	6.34	6.44	4.82	7.96	8.05	6.34
Large	5.65	2.47	7.01	6.16	7.42	2.30	4.57
P - value	0.38	0.04**	0.34	0.02**	0.08*	0.16	0.07*
Source of Income							
Agriculture	5.63	6.39	7.38	4.75	3.35	4.43	4.86
Service/Salaried jobs	3.90	3.79	5.78	4.72	9.37	10.50	6.40
Local Business	6.44	15.10	2.82	11.80	5.13	14.10	10.55
Remittances	7.10	9.88	3.97	5.08	-	19.97	9.68
Seasonal labour	4.22	3.58	1.90	0.26	2.94	8.45	8.87
P - value	0.14	0.15	0.45	0.19	0.06*	0.19	0.02**
Land category							
Landless/Marginal	10.86	18.19	5.56	6.29	11.63	21.31	10.90
Small	5.41	5.27	5.84	3.52	5.06	6.08	5.29
Large	1.73	0.71	3.56	2.51	0.70	0.84	0.80
P - value	0.04**	0.01***	0.33	0.15	0.02**	0.00***	0.00***
Social participation							
No	14.94	16.53	7.31	4.52	11.06	10.79	7.34
Training/Demonstration	5.78	11.43	6.07	3.98	9.65	6.42	6.09
Group member	4.98	4.57	11.41	3.21	8.06	2.16	4.74
Both (T/D & GM)	2.45	0.77	2.39	1.29	3.80	-	1.08
P - value	0.05**	0.02**	0.564	0.05**	0.09*	0.08*	0.06*

Source: Field Survey, 2009

Note: ***significant at 1 percent, ** significant at 5 percent, * significant at 10 percent and P value indicates probability value from F test.

The land categories and source of family income are highly significant in 1 and 5 percent level of significance respectively. Similarly the literacy rate and family size as well as the social participation are also significant at 10 percent level of significance for the food insecurity gap index. Large sized family household suffer least from the depth of food insecurity. That may be due to the availability of human-power for agricultural and economic activities so that make able the households for better acquisition of food materials either by producing or by procuring. The households having their traditional and local business as the income source are the most vulnerable in terms of depth of food insecurity (10.55 percent), followed by the household having their members out of country (9.68 percent). Large landholders, with least depth of food insecurity were significantly similar to all studied clusters and VDCs, was supported by Joshi, 2008.

5.5.3 Food Insecurity Severity Index (FISI)

This is the degree of impact of food insecurity to the studied area and here are the comparative studies of severity in regard with different socioeconomic and behavioural drivers of food security (table 5.9). Female have more severity of food insecurity than that of male in all VDCs as well as in aggregate. Land category and educational status are highly significant with 1 percent level of significance. The illiterate households who are landless or marginal have highest severity index. Dalits are most vulnerable caste group than other three but this not significant. Small sized family have greatest severity (1.39) in comparison with the other two and this figure is significant at 10 percent level of significance. Source of family income and social participation is also significant at 10 percent level of significance and the families having local business as the source of family income have the highest value of severity index (2.59) followed by the remittances(1.35) and seasonal labour(1.25). In case of social participation, households having participated in agricultural trainings and demonstration as well as being member of farmer group or any social institutions have the least severity (0.51) while the households having no participation in agricultural development and members of any agricultural and social institutions have the highest severity index (2.29) of food insecurity. These distributions of food insecurity severity index along with VDCs in terms of different socioeconomic and behavioural derivers varies but keeping the composition similar to the holistic result.

Table 5.8 FISI with different socio-behavioural drivers of food security of Rukum

Variables	Khara	Peepal	Mahat	Chunbang	Hukam	Khalanga	Total
Sex							
male	0.45	0.70	1.07	0.78	1.51	1.89	1.05
female	0.81	0.37	0.95	0.87	2.49	3.15	1.28
P - value	0.18	0.42	0.23	0.03**	0.07*	0.18	0.18
Ethnicity							
Bahun	0.10	1.40	1.79	0.01	10.13	1.60	1.29
Chhetri	0.41	0.38	1.26	0.38	0.90	1.55	0.86
Janajati	0.79	0.48	0.19	1.08	0.94	1.12	0.73
Dalits	0.71	0.86	2.72	1.02	2.46	2.97	2.00
P - value	0.04**	0.16	0.05**	0.18	0.12	0.28	0.09*
Literacy							
Illiterate	0.75	0.53	1.41	0.77	1.59	1.59	1.12
Literate only	0.41	0.87	0.92	0.36	0.67	0.90	0.88
School Education	0.19	0.58	0.73	1.46	1.09	1.73	0.53
College Education	0.25	0.35	0.60	0.44	2.56	0.80	0.45
P - value	0.04**	0.12	0.09*	0.37	0.19	0.08*	0.01***
Family size							
Small	1.41	1.65	1.44	1.43	1.27	2.88	1.39
Medium	0.89	0.74	0.89	0.94	1.89	1.50	1.05
Large	0.62	0.12	0.28	0.67	0.81	0.05	0.42
P - value	0.15	0.02**	0.04**	0.14	0.08*	0.25	0.06*
Source of Income							
Agriculture	0.62	0.67	0.86	0.64	0.92	0.99	0.78
Service/Salaried jobs	0.25	0.35	0.60	0.44	4.56	2.80	0.98
Local Business	0.70	1.28	0.59	2.76	2.18	3.64	2.59
Remittances	1.51	2.29	2.27	0.45	-	3.99	1.35
Seasonal labour	2.18	3.13	4.25	1.00	6.10	0.93	1.25
P - value	0.02**	0.04**	0.03**	0.28	0.64	0.899	0.07*
Land category							
Landless/Marginal	2.41	3.93	2.97	1.59	2.85	5.17	3.86
Small	0.54	1.56	0.46	0.98	1.81	0.93	1.79
Large	0.23	0.03	0.06	0.22	0.52	0.45	0.32
P - value	0.15	0.00***	0.02**	0.41	0.09*	0.01***	0.00***
Social participation							
No	3.39	2.75	3.07	5.58	3.88	2.37	2.29
Training/Demonstration	2.47	1.44	1.23	0.32	1.14	1.41	0.96
Group member	1.59	0.39	2.11	1.54	1.21	0.41	0.64
Both (T/D & GM)	0.52	0.01	0.14	0.03	0.14	-	0.51
P - value	0.02**	0.06*	0.08*	0.03**	0.15	0.48	0.07*

Source: Field Survey, 2009

Note: ***significant at 1 percent, ** significant at 5 percent, * significant at 10 percent and P value indicates probability value from F test.

6 CONCLUSION AND RECOMMENDATION

6.1 Summary

The study was conducted to assess the socioeconomic and behavioural drivers of food security in Mid Western Hills taking Rukum as representative district. A survey sample of 1000 households of Khara, Peepal, Mahat, Chunbang, Hukam and Khalanga VDCs in Rukum district were taken.

Food security is the outcome of mainly three factors; the food availability, food access and food consumption and their stability over time. On each of these factors of food security, different socioeconomic and behavioural attributes of household act upon and household food security as a whole is influenced. However, the key variables are the land holding, source of family income, and literacy rate that are significantly associated with household food security.

A majority of the farmers (72.0 percent) were Janajati (36.7 percent) and Chhetries (35.7 percent). Most of the farmers (75.4 percent) were under 55 years with illiteracy (52.7 percent). Family size was generally medium (65.2 percent) with a majority (73.9 percent) living in nuclear family. Most of the farmers were married (77.5 percent) and more respondents were male head of household (83.6 percent).

Farm size was generally small. A majority of the farmers (92.3 percent) had less than 2 hectare of farm land. Three main source of family income is the Agriculture (53.1 percent) followed by Salaried service or pension (26.6 percent). Only 7.7 percent household heads were adequately social participated but huge population (60.4 percent) was devoid of such participation.

The agriculture was mostly rainfed having only 32.16 percent of total arable land irrigated. The main staple food was maize (53.6 percent) followed by rice (44.9 percent). The major cropping pattern is maize and wheat system (43 percent) and the cropping intensity was in between 1 and 2 crops (66.2 percent). The consumption pattern is marginalized and poor resulting 83 percent of population food deficit on the basis of calorie requirement (2344 kcal per person per day). The household food security seems to have strong correlation with the landholding category, source of family income and the literacy rate of household.

6.2 Conclusion

Lack of markets, transportation and motorable road network and high prices of food products of recent past years were key factors for increasing the food insecurity incidence within the rural, marginal and poor households with lack income opportunities. Further, the marginality of productivity, lower and ever decreasing production of agricultural commodities were other likely factors assumed for food insecurity incidence. Very traditional cropping pattern and lower intensity had no support for self reliance on food and resilience of the food security problem.

The maize and wheat system having 43 percent share, followed by rice and maize system (33 percent) and at the same time cropping intensity in between 1 and 2 (66.2 percent) was showing the maize is the dominating crop all over the district and the cropping practices could be improved with increasing the intensity and practices of cropping. The line of hope was seen with the figure of about 63 percent of households having the kitchen garden; however, the crops were local vegetables and spices. Similarly the practice of rearing large no of livestock depicted the possibility of securing food through income generation by trading livestock products, farming organically with improvement in Farm Yard Manure (FYM). That ensures better and increased crop production and productivity that may be milestone for ameliorating the incidence of food insecurity.

The consumption practice was inefficient and consumption was poor in Rukum. The higher incidences of food deficit as well as diseases may be due to inefficient consumption practice and unhygienic and poor consumption. However nominal large landholders were food secure irrespective of their inefficient consumption practices. That may be due to higher availability of food stuffs. The incidence was higher (82 percent) in both male and female headed households in Rukum district irrespective of age group. The gap was the highest in Hukam and higher for Khara and Khalanga, than Rukum as a whole. The severity was highest in female headed households in Chunbang and Hukam only. In case of Ethnicity/Cast, Dalits were most affected (98 perecent) however other three groups were affected by almost 10 percent less incidence of food insecurity. The gap was also highest for Dalits, however significant only in case of Khara. Ethnicity was significantly linked with severity in total, but highly significant in case of Khara and Mahat. That may be due to dominance of resource less Janajati and Dalits living with traditional cropping practices.

Food Insecurity Incidence (FII) was insignificantly associated with the level of literacy however the incidence for all level of education is similarly high (around 80 percent). The gap was significant at 10 percent level of significance with education status of Rukum, however highly significant in Hukam and Khalanga. It was highly significant (<0.01 p-value) in terms of severity of food insecurity, however the Khara, Mahat and Khalanga only showed the significance at p<0.10. There seems direct link in between the incidence of food insecurity and the source of family income as the households having seasonal labor (100 percent) and local business (95.7 percent) on the bases of traditional knowledge were mostly influenced by the food insecurity. This may be due to the inability from low earning source for affording the costs of food. The gap index is significantly correlated with the family income and highest for the households sustaining from local business on traditional skills. Severity was significant with household family income, however non significant results were obtained in Chunbang, Hukam and Khalanga.

There was no significant correlation of FII with the different sized family however the index was higher (more than 80 percent). Family size was in turn significant with the gap index of food insecurity. Furthermore, in Peepal and Chunbang, the gap index was highly correlated with family size. Similarly, the depth of insecurity is highly significant in Peepal and Mahat and significantly correlated with Rukum. Land size was significantly associated with the incidence of food insecurity, the most vulnerable group was the landless and marginal land holders (94.1 percent), while large sized land holders suffered least (56.5 percent), although this figure seems higher in context of national figure. The gap index and severity of food insecurity were highly significant for Rukum as a whole and also true for Peepal and Khalanga. However, Khara and Hukam also showed significant correlations with gap.

Social participation seems highly correlated with the food security of Rukum district. The households having highest exposure in social and agricultural activities are relatively food secure and those with least exposure infected by highest incidence of food insecurity. It was significantly correlated (at 10 percent level of significance) with the gap and severity of food insecurity showing highly significant result in Khara and Chunbang but in Peepal the gap was significant at 5 percent but the severity at 10 percent level of significance.

6.3 Recommendation

The climatic condition and geological situation supports for the production of a large number of crops. However there is high opportunity for the livestock and crop and seed production especially of temperate fruits and vegetables. The concentration of trainings, researches, inclusion of technologies and modern agricultural inputs should be promoted and the flow of resources are recommended for the better study, adaptation and promotion of the livestock, vegetable and fruit production in Rukum District.

The consumption practices were insufficient and poor. The production of alcoholic beverages directly fermenting the food stuffs; especially the millet and rice had caused the losses of food stuffs in terms of calorie achievement. The double laggards; the practice to consuming rice by purchasing as main staple food and ignoring other minor staple foods that could be produced locally with least effort, made the situation more vulnerable than expected . That could be corrected by improving the consumption pattern and practices with incorporating the minor but locally available food stuffs, and hereby suggested for further researches.

The transportation, undoubtedly, should be improvised. Similarly, the irrigation facilities could be provided with least efforts since the water availability in Rukum is higher and diverting the streams and water channels to the field seems comparatively economic in Rukum. The educational, health facilities were found in marginal stage due to inadequate infrastructure and human resources. These have to be improved for better and prompt adaptation and operation as well as implementation of agricultural technologies as well as hygienic-livelihood infrastructure development programs. Further the well managed market networks, better employment opportunities should be created with integrated approaches of the district level or higher authorities.

The scattering approaches could not solve the multidimensional problem of the food security which was and is linked with different social, economical and behavioural drivers of society. All drivers have to be addressed individually but through integrated approaches. That may need broad political commitments on higher level and prompt implementation at district level. Finally it is recommended to make such political commitments and provide the practical and prompt solution for the problem of food insecurity not only in Rukum but in all food insecure districts.

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APPENDICES

Appendix 1 Calorie content per 100 grams of edible portion of food

S.N.	Food items	Calorie	S.N.	Food items	Calorie	S.N.	Food items	Calorie
Cereals and grains			**Livestock product**			**Spices and condiments**		
1	Rice	345	17	Ghee	900	32	Garlic	300
2	Wheat	341	18	Poultry	138	33	Ginger	300
3	Maize	342	19	Goat meat	161	34	Red chili	25
4	Beaten rice	346	20	Fish	97	35	Coriander	300
5	Buck wheat	342	21	Buffalo milk	67	36	Cumin	300
6	Millet	331	22	Cow milk	61	37	Vegetable oils	900
7	Barley	350	23	Eggs	158	38	Mustard	900
Green vegetables			**Fruits**			39	Sugar	398
8	Leaf vegetables	26	24	Banana	116	40	Salt	0
9	Potato	97	25	Peach	40	**Others**		
10	Radish	20	26	Apple	59	41	Honey	550
11	Tomato	23	27	Citrus	48	42	Biscuit	360
12	Onion	50	28	Papaya	52	43	Alcohol	0
Pulses			29	Grapes	45	44	Tea/Coffee	0
13	Soybean	416	30	Mango	74			
14	Black gram	347	31	Pineapple	35			
15	Lentil	343						
16	Pigeon pea	335						

Source: Joshi, 2008; Calorieking, 2008; Prennushi, 1999; Latham, 1997

Appendix 2 Conversion factor to compute adult equivalents

Age group	Adult equivalence		Age group	Adult equivalence	
	Male	**Female**		**Male**	**Female**
Under 1 Year	0.33	0.33			
1-1.99	0.46	0.46	12-13.99	0.96	0.84
2-2.99	0.54	0.54	14-15.99	1.06	0.86
3-4.99	0.62	0.62	16-17.99	1.14	0.86
4-6.99	0.74	0.70	18-29.99	1.04	0.80
7-9.99	0.84	0.82	30-59.99	1.00	0.82
10-11.99	0.88	0.78	60 and over	0.84	0.74

Source: Joshi, 2008; Gamba, 2005 (as per World Health Organization)

Appendix 3 Livestock standard Units

For the count of average no of livestock, following formula provided by Adhikari, 2000 of livestock standard unit was adopted.

LSU= 1 (Cow/Ox) + 1.5 (Buffalo) + 0.6 (Swine/pig) + 0.4 (Goat/Sheep) + 0.2 (Poultry).

Appendix 4 Households using different Roofing materials in Rukum district

S.N.	Roofing materials	Frequency	Percent
1	Thatch roof/mud	498	49.8
2	Slate/wooden planks	348	34.8
3	Corrugated Zinc sheets	111	11.1
4	RCC/RBC	43	4.3
Total		**1000**	**100.0**

Source: Field Survey, 2009

Appendix 5 Major Cropping pattern of Rukum district

S.N.	Cropping pattern	Frequency	Percent
1	rice+wheat system	203	20.3
2	rice+maize system	333	33.3
3	maize+wheat system	425	42.5
4	Others	39	3.9
Total		**1000**	**100.0**

Source: Field Survey, 2009

Appendix 6 Staple foods in Rukum district

S.N.	Staple foods	Frequency	Percent
1	Rice	449	44.9
2	Maize	536	53.6
3	Wheat	14	1.4
Total		**1000**	**100.0**

Source: Field Survey, 2009

Appendix 7 Kitchen garden holding practices in Rukum district

S.N.	Kitchen garden holding	Frequency	Percent
1	Yes	628	62.8
2	No	372	37.2
Total		**1000**	**100.0**

Source: Field Survey, 2009

Appendix 8 Major constrains of food security and livelihood in Rukum District.

S.N.	Major constrain of livelihood	Percent
1.	Road/ transportation	14.0
2.	Irrigation facilities	10.5
3.	Ag. Inputs availability	9.0
4.	Ag. Training and extension	7.5
5.	Health and education facilities	7.5
6.	Electricity and machineries	6.0
7.	Business and market opportunities	6.0
8.	Rainfed and traditional agriculture	5.0
9.	Natural hazards and shocks	4.5
10.	Safe drinking water	4.5
11.	Agricultural advancement and modernization	4.5
12.	Employment opportunities	4.0
13.	Food availability year round	3.5
14.	Marginal land	3.0
15.	Banks and financial institutions	3.0
16.	Natural famine	2.0
17.	Availability of skilled/non skilled manpower	1.5
18.	Conflict	1.5
19.	Availability of basic needs	1.5
20.	Poverty and population density	0.5
21.	Child care and maternal health	0.5
	Total	**100**

Appendix 9 Reference indicators of Food security phase classification

Reference Indicators			phase 1 Generally Food secure	phase 2 Moderately food insecure	phase 3 Highly food insecure (starting affecting livelihood assets)	phase 4 severely food insecure (acute food and livelihood crisis)	phase 5 Humanitarian emergency/Famine	Observations
1. Food availability	a	crop production / situation	T: up to 10-20% less than normal M+H: up to 10% less than normal	T: 20-40 % less than normal N+H: 10-30% less than normal	T: 40-60% less than normal M+H: 30-50% less than normal	T: 60-80 % less than normal M+H: 50-70% less than normal	T: >80 % less than normal M+H: >70% less than normal	Normal yield is based on 5 years average in the district (M=mountains H=hills, T=Terai)
	b	HHs food stocks	> 50% HHs with more than 3 months food stocks	T: > 50%HHs with 1-3 months food stocks N+H: > 50% HHs with 2-3 months food stocks	T: > 30% HHs with < 1 month food stocks M+H: > 30% HHs with 1-2 months food stocks	T: 30-50% HHs with depleted food stocks M+H: 30-50% HHs with < 1 month food stocks	>50% HHs have depleted food stocks	
	c	stock of main staples in key markets	2- 3 months stocks	1-2 months stocks	less than 1 month stock	stocks depleted	stocks depleted	
2. Food access	a	wage employment opportunities within district	as per normal situation	10-30 % fewer opportunities compared to normal situation	30 - 50 % fewer opportunities compared to normal situation	Opportunities decreased by > 50 % or no opportunities	no opportunites	normal employment condition is based on people's perception
	b	sale of NTFP, cash crops and other agr. products	income as per normal situation	income decreased by up to 30 % compared to normal situation	income decreased by 30 - 60 % compared to normal situation	income decreased by >60 %	no sales	Normal income earnings are based on people's perception
	c	market price of rice	decreased, constant or up to 10% of normal price	increased by 10-20% of normal price	increased by 20-40% of normal price	increased by more than 40-80% of normal price	increased by more than 80-100% of normal price	compared to average price during same period last year
3. Hazards	a	natural disasters	No natural disasters or occurrence causing <20 % loss of food stocks and assets	occurrence of natural disaster causing 20-30 % loss of food stocks and assets	occurrence of natural disaster causing 30-50 % loss of food stocks/assets and human casualties	occurrence of natural disaster causing >50% loss of stocks and assets and human casualties	occurrence or large scale devastating natural disasters (i.e. earthquake) causing complete destruction, significant human casualties, displacement	assets include land, agricultural tools, cattle, houses
4. Out-migration	a	Out-migration	up to 10% increase of traditional seasonal out-migration	10-20% increase of traditional seasonal out-migration	up to 20-40% increase of traditional seasonal out-migration	>40% increase of traditional seasonal out-migration	large scale out-migration	Traditional seasonal out-migration is based on people's perception
5. Coping	a	Coping	Traditional coping mechanisms that are part of livelihood strategy (migration, wage labour, sell NTFP, consumption of wild food)	change in regular food habits (reduce quantity food, less preferred food), borrowing food/money, selling of non-productive assets	HHs adopt irreversible coping strategies (selling of productive assets - livestock, land, seed) and skipping meals	HHs adopt a high level of irreversible coping strategies including, increased sale of productive assets, looting, and high dependence on wild foods	no more coping mechanisms, starvation and death	
6. Food utilization	a	acute child (<5 years) malnutrition			10-15%	> 15%	>30%	to measure and consider only if the other indicators give evidence of being in phase 3, 4 or 5 (random measurement of MUAC by FMs)
	b	disease	no significant cases of disease	significant cases of diseases under control	epidemic outbreak, increasing	pandemic outbreak	pandemic outbreak	
7. Civil security	a	Civil security	general peaceful situation	security situation deteriorating (bandhs and roadblocks 7-15 consecutive days / 3 months)	movement restricted (bandhs and roadblocks 15-30 consecutive days / 3 months)	movement restricted (bandhs and roadblocks > 30 consecutive days / 3 months)	high intensity conflict situation, displacement	

Source: WFP, 2009

Appendix 10 Household Survey Questionnaire

Socioeconomic and Behavioural Assessment of Food Security in Rukum District.

RESIDENTIAL QUESTIONNAIRE

A. General Questions

a. Farmers' Name: ………………………………………..

b. VDC/Village: ……………………………….

c. Conflict affected type: Death/Disable/Displaced and tortured/None

d. Marital status: Married/ Single

e. Family structure: Nuclear/ Joint

f. Family description:

S.N.	Name	Age	Sex	Education	Job	Basic salary(Rs/M)	
						<1000	>1000
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

g. How long has your family lived in this community? ………............years

h. What caused your family to live in this community?

1= born here   2= marriage

3= food security condition,   4= safe from natural disaster

5= political reasons   6= economic reasons (jobs, lands, business)

7= other (specify)

i. What ethnic group do your belong to?

1=Bahun,   2=Chhetri,

3=Janajati,   4=Dalit or occupational caste

j. What type of roofing material do you have? Tick any.

1. Thatch roof/ mud cover   2. Slate/wooden planks

3. Corrugated zinc sheets   4. RCC/RBC

k. What is the approximate distance from the nearby market, forest, river and border to your dwelling?

a) From market…………   b) from forest……….

c) From river……………. d) from border………

l. What type of road is connected with your home village?

B. **Agricultural Status**

Q.1 How much area of land do you have? Give the land description.

Types	Own land	Leased land	Share-cropping	Total land
Upland				
Lowland				
Total				

Q.2 What is your food self-sufficiency category or how much does your produce could fetch your consumption?

(a). Sufficient for 12 months

(b). Sufficient for 6-12 months

(c). Sufficient for up to 6 months

(d). Landless/Tenant

Q.3 What is your main staple food? How long do you consume them?

Crops	Staple Food (Tick)	Consumption (Times/Month)
Rice		
Wheat		
Maize		
Millet		
Barley		
Potato		
Others(specify)		

Q.4 What is the area under the crops and quantity grown by you in last year?

Crops	Upland		Lowland	
	Area (Rop.)	Quantity(Kg)	Area (Rop.)	Quantity(Kg)
Rice				
Wheat				
Maize				
Millet				
Barley				
Potato				
Vegetables				
Others(specify)				

Q.5 What are the normal soil and crop rotations practiced by you?

Seasons	Upland	Lowland
Winter		
Summer		
Rainy		

Q.6 Do you raise livestock? Yes/No ………………
If yes, Please indicate livestock, their numbers and last year production.

Livestock	Numbers	Production			
		Meat (Kg)	Milk (Lt)	Eggs	Others
Cows					
Buffaloes					
Sheep					
Goat.					
Pigs					
Poultry					
Other (specify)					

Q.7 Have you faced any natural hazard or famine in your VDC last year? Yes/ No …
If Yes,

Crops	Causes (D/Di/L//F/R/H/Hu/O)	When	% Loss	Scoping Strategies
Rice				
Wheat				
Maize grains				
Millet				
Barley				
Potato				
Vegetables				
Others(specify)				

Note: D=Drought, Di=Disease, L=Landslide, F=Famine, R=Excess rain, H=Hailstone, Hu=Hurricane, O=Others)

Q.8 What were the seed rates (kg/ropani) for cultivation of following crops in last year?

Crops	Irrigated condition	Rainfed condition
Rice		
Wheat		
Maize		
Millet		
Barley		
Potato		
Vegetables		
Others(specify)		

Q.9 Where do you buy the seeds from?

Crops	Source	Quantity (kg)	Price paid, Rs/kg
Rice	a)	a)	
	b)	b)	
Wheat	a)	a)	
	b)	b)	
Maize	a)	a)	
	b)	b)	
Millet	a)	a)	
	b)	b)	
Barley	a)	b)	
	a)	b)	
Potato	a)	b)	
	a)	b)	
Vegetables . ……………..	a)	a)	
	b)	b)	
Others(Specify)	a)	b)	
	a)	b)	

Sources: National Seed Co (NSC), DADO (DA), Agrovets (A), Dealers (D), Farmer (F)
Local Market (L), Neighbor (N)

Q.10 Did you use "improved seeds" in last year?   Yes/ No……

If yes, from where did you get the improved seeds in the past?

Crops	Source Received	Quantity, kg
Rice		
Wheat		
Maize		
Millet		
Barley		
Potato		
Vegetables		
Others(Specify)		

Q.11 How much fertilizers do you use for the crops (Kg/ropani)?

Name of Fertilizer	Rice	Wheat	Maize	Millet	Barley	Potato	Vegetables	Others
OM/FYM								
Urea								
DAP								
MoP								
Others(specify)								

Q.12 What are the major diseases and pests of crops?

Crops	Pests/Diseases	Treatments	Cost
Rice			
Wheat			
Maize			
Millet			
Barley			
Potato			
Vegetables			
Others (specify)			

Q.13 Have you received training in agriculture? Yes/ No……..
If yes, in which crops and how long?

Crops	Duration (Days)	Institution
Rice		
Wheat		
Maize		
Millet		
Barley		
Potato		
Vegetables		
Others(specify)		

Q.14 Do you sell your produce? Yes/No…………
If yes, where and at what price have you sold your produce?

Crops	Where	Quantity	Price(Rs/kg)	Total amount (Rs)	Profit made(Rs)
Rice					
Wheat					
Maize					
Millet					
Barley					
Potato					
Vegetables …………					
Others(specify)					

Q.15 What is the price of inputs in the local market. Rs/kg?

Crops	Seed, Rs/kg	Fertilizers/Pesticides	Price, Rs/kg
Rice		Urea	
Wheat		Complexal	
Maize		Super phosphate	
Millet		Murate of potash	
Barley		Malathion	
Potato		Others(specify)	
Vegetables			
Others(specify)			

Q.16 Have you taken part in any demonstrations on improved crop varieties carried out by DADO and other line agencies? Yes/No………..

If yes, which crops and where?

    a) Rice

    b) Wheat

    c) Maize

    d) Millet

    e) Barley

    f) Vegetables

    g) Others (specify)

Q.17 Are you a member of farmers' groups or cooperatives? Yes/No……..

If yes, of which types

    a) Farmers' groups

    b) Cooperatives

    c) Any other………….

Q.18 Have you received food grains/stuffs from the Non/Government? Yes/ No, If yes,

Crops	When/Times	Quantity, kg/month	Source
Rice			
Wheat			
Maize			
Millet			
Vegetables			
Oils/Ghee			
Sarbotam Pitho			
Milk			
Others(specify)			

Q.19 Have you borrowed any loan from any source?

Source	Amount (Rs.)	Interest rate (%)
Bank		
Moneylender		
Cooperative		
Others(specify)		

Q. 20 What is the consumption pattern or dietary diversity of your family?

S.N.	Food groups	Days/Week
1	Rice	
2	Maize/Wheat	
3	Pulses/Beans	
4	Vegetables	
5	Meat	
6	Milk	
7	Sugar	
8	Oil/Ghee	

Q.21 List 5 major constrains affecting livelihood of farmer of this locality.

a)

b)

c)

d)

e)

THANK YOU FOR THE CO-OPERATION.

BIOGRAPHICAL SKETCH

The author was born in 16th December 1982 in Ward No. 5, Shivanagar VDC of Chitwan District. He is the youngest son of Umadevi and Balkrishna Dhakal. He did his School Leaving Certificate from Shree Narayani Vidhya Mandir Secondary School, Shivanagar in 1999.

He completed his Proficiency Certificate level in Science (Biology) from Thribhuvan University (TU) in Birendra Multiple Campus, Bharatpur in 2002. Then, he joined for Bachelor of Science in Agriculture in Institute of Agriculture and Animal Sciences (IAAS), Rampur of same University. He passed that degree with the First Division in 2006. In the course of pursuing higher study, he joined the Master degree of Economics in Central Campus, TU, Kritipur in 2007.

He has travelled different parts of several districts of Nepal during the course of different personal, social and developmental activities. He has obtained a number of trainings related to his profession and participated various seminars and workshops. He has keen interest and strong desire to work in the rural communities for food security, natural resources conservation and community development.