CHAPTER III

RESEARCH METHODS

3.1 Conceptual framework

Household is a basic unit of community which can be used to analyze and address food security issues at the micro level. The household level food security status consists of both food availability and food accessibility situation. These situations are determined by household resources, socio economic factors and community level and condition. At the household level, household head's decisions are guided by household traditions, cultural and resource endowments determine the food security or insecurity of the particular house. Collective household status of particular ethnic community exposes food security status of that community. Access to resource and infrastructure endowments, social culture and norms and social organizations affect food security status of that community. Through investigation of the food insecure households of any community, national level policy makers can be informed and such information can help to design program interventions to reduce vulnerability at the community level.

The study was based on the conceptual framework presented in Figure 3.1. This framework provides a way of looking food availability, food access and food utilization where household food security is determined by household food adequacy. USAID (1995) defines food security "when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life". Achieving food security requires that the aggregate availability of

physical supplies of food is sufficient, that households have access to those food supplies through own their production through the markets or thought other sources and that utilization of those food supplies is appropriate to meet their dietary needs (food requirements) of the household. It is dependent upon the level of household factors namely income, production, resources, consumption and nutritional behavior and household size along with other factors namely national policy, institutional support, market and socio economic resources and context.

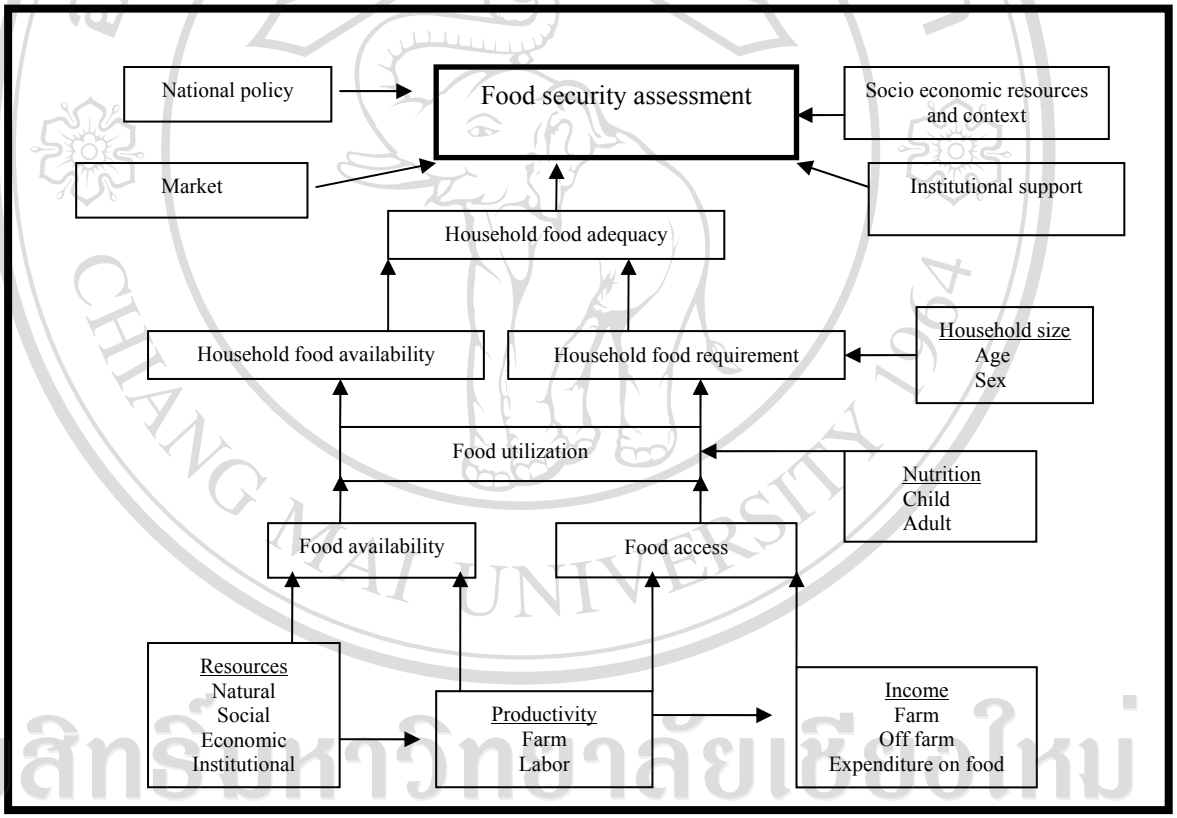

Figure 3.1 Conceptual framework for studying household food security in this study

3.2 Study sites and field survey

Seventy two households from twelve sites of Tharu community under ten Village Development Committees (VDCs) and one municipality of study area and six farming households in each site was chosen through stratified random sampling

technique for the formal survey with questionnaires in the Dang district, Mid-western region of Nepal.

Primary data was collected from household survey and community workshops and some household level whereas secondary data was gathered from published materials, periodic reports, journals, research papers, policy papers, personal communication, case studies etc. Community level information like perceptions of multi stakeholder and key informants was gathered by twelve community workshop to identify constraints to and strategies for improving food security of Tharu farming communities.

3.3 Data analysis

Collected data were compiled and different factors and conditions were grouped, classified, quantified and analyzed through descriptive and inferential statistics. This study focused on food security analysis of the household level under Tharu farming ethnic community by comparing household food availability and household food requirement which was calculated by household food adequacy. Ordinary least square regression was employed to analyze factors affecting food security. Seasonality analysis was done to identify gap on crops, labor, income, expenditure and food adequacy and rich picture were drawn to show factors affecting to food insecurity of Tharu ethnic communities.

3.3.1 Household food security analysis

To achieve first objective of the study i.e for the purpose of household food security analysis in this study, food balance sheet (food availability) and aggregate household calorie consumption was constructed and food security condition was

calculated based on calorie requirement, according to sex and age of household members recommended by Food and Agriculture Organization (FAO/UNO/WHO, 2001). Consumption below the minimum level of calorie requirement indicates food insecurity condition. Food sufficiency level or food requirement of household was compared with household food availability to assess degree of household food security status of Tharu ethnic communities. The survey data does not cover all types of food quantities consumed however the household survey only records quantities of cereals accessed within whole year to represent calorie intake of respondents throughout whole year. Food security is defined with reference to cereal food grains. The National Planning Commission had fixed for a variety of planning purposes minimum daily calorie requirements based on WHO guidelines, adjusted for climatic variations and demographic composition. The minimum calorie requirement for an average person of 2,250 kcal per day is used in Nepal (CBS, 2004). There is a need of an assumption about what proportion of minimum energy requirement is provided by cereal throughout year. Eighty five per cent of the cereal and 15 per cent of non cereal food is assumed as the percentages of total required calorie intake in Terai region of Nepal (World Bank, 1979). Out of total calorie requirement, 1,913 kcal (85 per cent of total energy requirement) and remaining 337 kcal (15 per cent of total energy requirement) are to be fulfilled from cereal grains and non-cereal like vegetables, milk, fish, poultry, meat and fruits respectively.

3.3.1.1 Household food availability

Household food availability is defined as the sum of cereal grains availability as household consumption in edible form. Edible cereal grain from own production (EC_{rnt}) is estimated from crude cereal grain shown in Appendix 4 where p is paddy, m

is maize and w is wheat, r is rice or rice equivalent, n is household and t is time index and FP is edible food from own production and TP is total crude production from own production.

To estimate edible paddy from total crude paddy, 10 per cent of total production was deducted for harvest loss and added 61.1 per cent for extraction rate and with deduction of processing loss (see Appendix 4).

$FP_{pnt} = (TP_{pnt} - TP_{pnt}*0.1) *0.611$ .....(1)

To estimate edible maize from total crude maize, 10 per cent of total production was deducted for harvest loss and added 96 per cent for extraction rate and with deduction of processing loss (see Appendix 4).

$FP_{mnt} = (TP_{mnt} - TP_{mnt}*0.1) *0.96$ .....(2)

To estimate edible wheat from total crude wheat, 10 per cent of total production was deducted for harvest loss and added 95 per cent for extraction with deduction of processing loss (see Appendix 4).

$FP_{wnt} = (TP_{wnt} - TP_{wnt}*0.1) *0.95$ .....(3)

Different edible cereal grains (EC_{rnt}) consumed by each household taken from household questionnaire (see Appendix 1) is converted into the form of quantity of edible rice from all types of cereal taken for consumption and measured in the term of kilograms (kg) per household per year which was calculated by summing different cereals and converted in an equivalent amount of rice. Maize and wheat are converted to the equivalent amount of rice then added to amount of rice to give total kilograms of cereal consumed from household. The conversion factors (3420kcal/3460kcal=0.988) kilogram of maize and (3410kcal/3460kcal=0.986)

kilogram of wheat are multiplied by 0.988 and 0.986 respectively to get rice equivalent (see Appendix 6).

$EC_{rnt} = FP_{pnt} + FP_{mnt} * 0.988 + FP_{wnt} * 0.986$ ..... (4)

Food consumption from own production (FP) is defined as household own production (HO) minus nonfood use (NF) (USDA, 1997).

$FP_{rnt} = HO_{rnt} - NF_{rnt}$ ..... (5)

Nonfood use is the sum of seed use (*SD*), feed use (*FD*) and other uses (*OU*) for different cereal.

$NF_{rnt} = SD_{rnt} + FD_{rnt} + OU_{rnt}$ ..... (6)

Household food availability of different cereal grain is the sum of household same type of cereal production (*FP*) plus quantity of purchase of cereal food grain (*CP),* changes in stocks (*CSTK*) and other sources (OS_{rnt}) in edible form.

$FA_{rnt} = FP_{rnt} + CP_{rnt} + CSTK_{rnt} + OS_{rnt}$ ..... (7)

3.3.1.2 Household food requirement

According to energy requirement by different age and gender, household cereal requirement (HR_{rnt}) was calculated to meet their minimum cereal needs as a minimum energy requirement at household level for all members of each household in the term of kilograms (kg) per household per year which is shown below in the Appendix 3. The number of people each category was multiplied by the quantity (kgs) of cereal required by that age/gender categories to meet 85 per cent of their minimum cereal needs as presented in equation 8.

$HR_{rnt} = (M_{0-4} * 118.4) + (F_{0-4} * 112.4) + (M_{5-14} * 195) + (F_{5-14} * 169) + (M_{15-19} * 242.1) + (F_{15-19} * 190.1) + (M_{20-59} * 220.6) + (F_{20-59} * 178.4) + (M_{60+} * 180.2) + (F_{60+} * 159.6)$ .....(8)

Where as HR_{rnt} is a household food requirement

M_{0-4} is the estimated food requirements for male in the 0-4 age group and F_{0-4} is the estimated food requirements for female in the 0-4 age group

3.3.1.3 Household food adequacy

Household food adequacy was calculated as percentage of annual household food requirement by met by household from annual household food availability. The quantity of each cereal food items consumed for each household was summed up for whole year to calculate annual household food availability shown in equations from 1 to 7. Then an annual household food requirement of each household was calculated by using energy requirement from different age and sex groups within each household (Equation 8 and Appendix 3).

Food security status was calculated on the basis of household food adequacy which was calculated by finding the percentage of annual household food requirement from annual household food availability (Equation 9).

HHFAP =HFC/HFR*100……(9)

Where HHFAP =Household food adequacy (percentage)

HFC= Household food availability

HFR= Household food requirement

The food security status of each household was based on household food adequacy percentage (HHFAP) which was calculated by finding the percentage of household food requirements that was met from food available to households. Based on HHFAP, households were categorized into food secure, marginally food secure and food insecure households and if HHFAP is ≥ 100, 80-99 and ≤ 79 respectively. The marginally food secure households are characterized by those households who are under transitional food security status and have face only food insecurity during poor harvest time. However, food insecure households are those who face food

insecurity every year as chronic food security situation.

3.3.2 Identification of key factors affecting household food security

To achieve second objective of the study, namely to identify key factors affecting household food security, the following factors under different household conditions were selected among households of Tharu ethnic communities in study area which is shown in Table 3.1.

Table 3.1 Household conditions as factors of food security as independent variables

Household conditions	Variable
Household social conditions	Head's health status
	Land ownership
	Age of household head
	Household size
	Farm size
	Educational status of household head
	Consumption pattern
Household economic conditions	Farm income level from crop production
	Farm income level from livestock
	Off-farm income
	Total income
	Expenditure on food
	Access to Market
Household institutional conditions	Access to extension services
	Participation on agricultural groups
	Adoption of modern variety seed
Household ecological conditions	Yield stability
	Access to irrigation
	Own production

The relationship and expectation of predefined independent variables at household level regarding household conditions of food security with household food

adequacy (Table 3.2) was analyzed by using ordinary least square regression model to assess the factors affecting household food adequacy at household level (Cited in Mutonotzo, 2006).

In order to analyze vulnerability of predefined independent variables on household food adequacy as percentage of household requirements met by household, the following linear regression model had been proposed in equation 10.

$$HH_{fa} = \beta_0 + \beta_1 X_{asset} + \beta_2 D_{lo} + \beta_3 X_{in} + \beta_4 X_{ys} + \beta_5 D_{hhsx} + \beta_6 X_{age} + \beta_7 X_{expfood} + \beta_8 X_{hs} + \beta_9 D_{partgroup} + \beta_{10} X_{fs} + \beta_{11} D_{ext} + \beta_{12} X_{tp} + \beta_{13} D_{edu} + \beta_{14} D_{irr} + \beta_{15} D_{mark} + \beta_{16} D_{tech} + \beta_{17} X_{ownprod} + \varepsilon_i \quad (10)$$

Where as,

HH_{fa}	=	Household food adequacy given as percentage of energy requirements met by household
β_0	=	Intercept
D_{lo}	=	Dummy for Land ownership
X_{in}	=	Household income
X_{ys}	=	Yield stability
X_{age}	=	Age of household head
$X_{expfood}$	=	Expenditure on food
X_{fs}	=	Farm size
$D_{partgroup}$	=	Participation in agricultural group
D_{hhs}	=	Head's health status
X_{hs}	=	Household size
D_{ext}	=	Dummy for access to extension service
X_{tp}	=	Traditional practice (Ratio of alcohol making cereal to consumed cereal)
D_{edu}	=	Dummy for education of household head
D_{irrig}	=	Dummy for access to irrigation
D_{mark}	=	Dummy for access to market
D_{tech}	=	Dummy for adoption of modern variety of rice
$X_{ownprod}$	=	Own production
β_s	=	Coefficients of variables
ε_i	=	Error term

Table 3.2 List of independent variables description and it's the relationship with dependent variable

Variable Description	Relationship with Dependent variable	Expected sign
Age of household head (Continuous variable)	Young people are stronger and are expected to cultivate larger-size farm than old people. Within limits, households headed by younger heads are more likely to meet their household food adequacy	Positive
Expenditure on food (Continuous variable)	Households with higher expenditure on food are likely to meet more of their household food adequacy than otherwise	Positive
Household size (Continuous variable)	Large household sizes are likely to meet less of their household food adequacy than households with fewer members	Negative
Land ownership (Dummy variable; 1 if owner, otherwise 0)	Households that own house are more likely to meet more of their household food adequacy than those who do not	Positive
Head's health status (Dummy variable; 1 if health status is good, otherwise 0)	Households whose head is in good health are more likely to meet better household food adequacy	Positive
Household income (Continuous variable)	Higher income from crop production is expected to give more household food adequacy.	Positive

Table 3.2 ***Continued…….***

Variable Description	Relationship with Dependent variable	Expected Sign
Participation on agricultural groups (Dummy variable; 1 if membership, otherwise 0)	Participation on groups increase household's income and food production and affect household food adequacy	Positive
Educational status of household head (Dummy variable; 1 if Household head that are literate, otherwise 0)	Education is a social capital, which could impact positively on household ability to take good and well-informed production and nutritional decisions.	Positive
Farm size (Continuous variable)	The larger the farm size, the higher the production level. It is expected that households with larger farm size are more likely to be food secure than those with smaller farm size.	Positive
Access to extension service (Dummy variable; 1 if access to extension office, otherwise 0)	Access to extension service develop skill for better production and lead to be household food adequacy	Positive
Yield stability (Continuous variable)	Yield stability is measured by coefficient of variation of yield in five years. Higher coefficient of variation denotes to be household food inadequacy.	Negative
Traditional practice (Ratio of alcohol making cereal to consumed cereal) (Continuous variable)	Higher ratio of food grain for making alcohol leads to be household food inadequacy	Negative

Table 3.2 ***Continued…….***

Variable Description	Relationship with Dependent variable	Expected sign
Access to irrigation (Dummy variable; 1 if access to irrigation, otherwise 0)	Access to irrigation relates to better production and lead to be household food adequacy	Positive
Access to Market (Dummy variable; 1 if near, otherwise 0)	Access to market relates to better access to food and lead to be household food adequacy	Positive
Access to adoption of modern rice seed (Dummy variable; 1 if use hybrid, otherwise 0)	Access to adoption of modern rice seed relates to better production and lead to be better household food adequacy	Positive
Own production (Continuous variable)	Households with higher own production are likely to be better household food adequacy	Positive

3.3.3 Constraints to household food security and strategies for improving food security

To achieve third objectives of the study, comparative analysis of perceptions among perceptions of multi stakeholders through community workshops and interviews and secondary information about the current national plan and policy was gathered and analyzed. The outcomes of community workshops was to explore current farming systems, technologies, resources, inputs, infrastructures, institutional support, population, livelihood pattern, household strategies and constraints to household food security and secondary information of the current national act, plan and policy related to agricultural development to set up new strategies for the improvement of household food security among Tharu farming communities.