Foreword

The efforts of the Royal Government of Bhutan to help vulnerable groups are an important part of the policy of *balanced and equitable development* enshrined in Bhutan's Gross National Happiness philosophy. The present document should be seen as a tool for furthering these endeavors. The 201 geogs (sub-districts) in Bhutan have been classified according to their level of vulnerability to food insecurity using criteria related to food availability, access and utilization of food. This study is a joint project of the Ministry of Agriculture and the World Food Programme, and is expected to guide strategic decisions for the continued collaboration between the RGoB and WFP. It also provides a tool for planning and impact monitoring in relevant government sectors.

Vulnerability Analysis and Mapping (VAM) was adopted by the United Nations World Food Programme to assist the country offices in prioritizing geographical areas in particular need of development and poverty eradication. One of the analytical outputs of VAM is a map showing the spatial variation of the vulnerability to food insecurity.

It is our hope that this report will be useful to the planners, decision makers and donor communities working towards the betterment of the vulnerable and disadvantaged groups in Bhutan. We sincerely appreciate the efforts made by many government officers and other individuals who contributed to the study; and in particular to the team from the MoA and the WFP for guiding the process towards this final report. Our acknowledgement also goes to all the officials in the dzongkhags for their full support and cooperation during the Knowledge Based Scoring exercise.

Gerald Daly
Country Representative
World Food Programme
Bhutan

Sangay Thinley
Secretary
Ministry of Agriculture
Royal Government of Bhutan

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Acronyms

BLSS	Bhutan Living Standard Survey
CSO	Central Statistics Organization
FAO	Food and Agriculture Organization
FCB	Food Corporation of Bhutan
GDP	Gross Domestic Product
GIS	Geographical Information System
GNH	Gross National Happiness
IMS	Information Management Section
KBS	Knowledge Based Scoring
Kcal	Kilo calories
MoA	Ministry of Agriculture
MDG	Millennium Development Goal
MT	Metric Ton
NSB	National Statistical Bureau
Nu	Ngultrum
PAA	Poverty Assessment & Analysis
PAR	Poverty Assessment Report
PCA	Principal Component Analysis
PPD	Policy and Planning Division
RGoB	Royal Government of Bhutan
RNR	Renewable Natural Resources
UNICEF	United Nations Children's Fund
USD	United States Dollar
VAM	Vulnerability Analysis and Mapping
WFP	World Food Programme

Terms and Definitions

Dzongkhag	District (there are 20 dzongkhags in the country).
Geog	Sub-district (there are 201 geogs)
Household	A person or group of persons operating as one economic unit. They usually have a common arrangement for the preparation and consumption of food and share the same kitchen.
Household head	The most knowledgeable person of all the household members and one who takes decisions in the household.
Household size	Total number of persons in the household.
Wetland	A terraced land which has access to artificially provided irrigation to grow paddy and other crops. There are rain-fed wetlands that are terraced.
Dry land	Generally agricultural land where crops are grown without irrigation.
Tseri	Tseri (shifting cultivation land) is cultivated for a year or two and left fallow for a number of years to rebuild soil fertility.
Pests	Includes pests and wildlife attacking crops and livestock.

Executive Summary

Bhutan has attained impressive achievements in its macro economy since the country opened up to the rest of the world in 1961 from a self imposed isolation. Despite impressive macro economic growth and achievements in human development at the national level, Bhutan still faces challenges on several issues the RGoB's commitment on halving poverty by 2015 as a part of MDG effort, growing inequality of income and wealth concentration, the regional disparities at household level food insecurity and seasonal hunger.

The task of reducing poverty and food insecurity is challenging for Bhutan. The country has a subsistent agrarian economy where agricultural production has not been flourishing due to limited availability of cultivable land, poor soil quality, low cropping intensity, labour shortage in the farms and a shift in the production of cereals for self consumption to production of cash crops. Bhutan's domestic food production is declining and failing to meet the increasing food demand inside the country. As a result, yearly imports of food are rising to fill the food gap. The RGoB's Poverty Analysis Report 2004 has established, for the first time, a consensus on the idea that some people live in poverty in Bhutan. The report also confirmed the existence of pockets of hunger in the country

In the case of Bhutan the spatial disparity in the intensity and severity of poverty and food insecurity is quite predominant through-out the country. To eradicate poverty and food insecurity, it is important to identify the geographical areas where the high levels of poverty and food insecurity prevail. This is also helpful for efficient targeting of scarce resources. Vulnerability Analysis and Mapping (VAM) was introduced within WFP to help country offices identify geographical areas vulnerable to food insecurity through a Standard Analytical Frame Work.

Thus, food insecurity here is analyzed in terms of availability of food, access to food and utilization of food. Availability of food generally refers to production and physical availability of food in a given area. Access refers to economic access to food that is the purchasing power of the people concerned. Utilization refers to the proper use and consumption of food commanded by a household and its members from their entitlement. Food availability is a community level concern, its access is a household level concern and utilization is an individual level concern.

Vulnerability is defined as the probability of an acute decline in food access or consumption levels that expose people to food insecurity. The two major components of vulnerability are exposure to risk and ability to cope with it. According to this definition, the inability to cope with a variety of risks may

affect a household's food security. A very straightforward way of measuring vulnerability is livelihood security.

Both the primary and the secondary data sets were stored, cleaned and analyzed using a statistical analysis package called SPSS. Through some trial and error method 10 indicators from the secondary database and seven indicators from the KBS were finally selected. These 17 indicators (Annex B) explain the four components of food insecurity, i.e. availability to food, access to food, utilization of food and the hazard situation**.**

To derive a composite food insecurity index for the country a multivariate statistical analysis called the Principal Component Analysis or PCA was run on the 17 indicators. For each geog there is an index value for the food insecurity. Geogs with vulnerability index falling into the 1st quartile were classified as most vulnerable to food insecurity while those falling into 2nd, 3rd, and 4th quartiles were classified as more vulnerable, less vulnerable and least vulnerable respectively. 51 geogs were classified as most vulnerable.

The final map shows geogs in the east and south as most and more vulnerable to food insecurity. A great deal of harmonization was found when the results were verified with some national surveys and other studies.

Since vulnerability or hazard is also an important component of food insecurity, the report also presents characteristics of food security by dzongkhags based on the results of the Knowledge Based Scoring (KBS) method. Social dynamics of food security was analyzed through the following: considering groups vulnerable to food insecurity, why the vulnerable groups are food insecure, the changing nature of food security, factors influencing the changes in food security situation, indicators of food insecurity by regions, and food aid received by the geog.

The report concludes that while Bhutan is not self-sufficient in food grain production, it has never suffered from an overall shortage of food supply since it was possible to fill the gap through imports.

The combined outcome of food availability, access, and utilization, and natural hazards has caused chronic and transitory food insecurity mostly in eastern and southern parts of the country.

Food insecurity is still confined to rural areas and chronic food insecurity prevails in pockets common among landless farmers, daily wage earners and farmers without sufficient land or livestock holdings. There is also transitory food

insecurity with seasonal food crises coinciding with the periods of intensive agricultural operations.

The report has, however, been limited by the unavailability of some very important indicators to assess and map food insecurity, such as rural-urban migration leading to labour shortage in rural areas, crop damage by wild life and pests, household level food storage capacity, household level food shortage. The secondary data used were mainly from the RNR Census 2000, which is now five years old and had its own limitations. The KBS method is perception based where bias and ignorance on the issues can skew the responses. On the other hand, however, this is the first report of its kind that is done at the national level using secondary data complimented by field based information.

Some of the major recommendations of the report, based mainly on field input, include the need to improve the agricultural extension delivery system, development of rural infrastructure particularly roads, pest management, creation of employment opportunities in rural areas, opening up more FCB branches, compensation for crop damage by wildlife, proper land management and soil conservation, and provision of proper storage facilities.

Chapter I

1. Introduction

1.1 Context of the present study

1.1.1 The country

Figure 1: Location map

The Kingdom of Bhutan is situated in the eastern Himalayas and landlocked between India and China. It has a land area of 38,394 square kilometers.[1] The country is mostly mountainous and the elevation ranges from 150 meters above sea level in the south to 7,550 meters in the north. Forests cover about 72 % of Bhutan, 10% of the lands are covered by year-round snows and glaciers, nearly 6.0 % is permanently cultivated or used for human habitation; and the remainder are pastures or meadows, lands previously used for tseri or shifting cultivation or barren rocky areas of scrubland.[2]

In 2003, the population of Bhutan was estimated to be 734,340 based on an annual growth rate of 2.5 percent[3]. The population growth rate rose from 2.6% in 1984 to 3.1% in 1994, and reduced to 2.5% by 2000. Still the country's population density of 18.7 persons per square kilometer (2002 estimate) is one of the lowest in the world.

About 79 percent of the populations live in rural areas that depend on agriculture and livestock rearing as their livelihoods[4]. There are an estimated 65,000 farming households scattered in small often remote villages in small numbers varying from a dozen to hundred or more households. Land is fairly distributed in the country. As per RNR Census 2000, about 14 percent of the households own less

[1] Statistical Year Book of Bhutan 2004, March 2004, National Statistical Bureau
[2] *Ibid*
[3] Estimates based on populating growth rate of 2.5%, *ibid*
[4] Estimate of agrarian population: Statistical Year Book of Bhutan 2004, March 2004, National Statistical Bureau

than 1.00 acre and 56 percent of the households have land holdings between 1.00 to 4.99 acres each. The census result also show that 2.6 percent of rural household do not have any agricultural land and they make their livelihoods by working as agricultural labours[5].

1.1.2 Food security and poverty situation in Bhutan

Bhutan has attained impressive achievements in its macro economy since the country opened up to the rest of the world in 1961 from a self imposed isolation. Despite such a late entry in the development arena, the country's GDP grew at an average of 6.6 percent over the years and GDP per capita income of the country has grown rapidly – from USD 51 in 1961 to USD 835 in 2002 higher than neighboring countries like India, Nepal and Bangladesh. In terms of sector wise contribution to the GDP, Bhutan is receiving an increasing share from industry and service sectors – with average annual growth rates of 8.2% and 7.8% respectively for the years 1993 to 2003. The share of agriculture in GDP has declined from 53% in 1983 to 33 percent in 2003.

The Bhutanese approach to development has been shaped and guided by the concept of Gross National Happiness (GNH) enunciated by His Majesty King Jigme Singye Wangchuk in the late 1980's. The unique concept of GNH indicates that development has many more dimensions than those associated with GDP, and that development should be understood as a process that seeks to maximize happiness rather than economic growth.

Today, conditions in Bhutan are very different from what they were in the 1960s. Over 90 percent of the population has access to primary health care and 65% of the rural population has access to safe drinking water. More than 90% of the children are immunized. Life expectancy at birth has gone up to 66 years. Net enrolment rates at primary schools are estimated to be 72%. New industries have been started and trade has expanded. Institutions promoting active people's participation in the development process have been established.[6]

Despite such impressive macro economic growth and achievements in human development indicators at the national level, Bhutan still faces challenges on several issues: the commitment of RGoB on halving poverty by 2015 as a part of the MDG effort, growing inequality of income and wealth concentration, the regional disparities at household level food insecurity and seasonal hunger. The

[5] ibid
[6] Bhutan National Human Development Report 2000, Planning Commission, RGoB

concept of poverty is relatively new for Bhutan and complements the concept of "National Happiness".[7] According to the 2004 Poverty Assessment Report, 31.7 percent of the Bhutanese populations live below the national poverty line of Nu. 740.36 per capita per month. This is equivalent to a minimum consumption of 2,124 Kcal per day per person and a set of basic non-food items. For Bhutan, poverty and food insecurity is predominantly a rural phenomenon with a rural poverty incidence of 38.3 percent against an urban poverty incidence of 4.2 percent. The BLSS 2003 depicted that agricultural activities constitute the major source of income for the 95% of the rural poor. The report also states that food poverty is non existent in urban areas compared to 4.7 percent in rural areas and average rural income constitutes 45 percent of the average urban income.

Besides the rural urban differences of poverty, the geographical variation of incidence, intensity and severity of poverty is also quite important in poverty reduction initiatives. Almost half of the population (48.8%) living in the eastern parts of the country is poor, whereas the central region has 29.5 percent population living in poverty and 22.2 percent poor households. The western region has the lowest poverty incidence with an 18.7 percent population and 12.7 percent of households living below the poverty line.

One of the major risks faced by a significant proportion of Bhutanese families relates to seasonal shortages of food or food insecurity. Thus, according to a Food Security Survey, about 39% of households in Pemagatshel suffered chronic food insecurity, while the proportion was 19% in Lhuntse.[8] Also, food insecurity was found to be high in urban and peri-urban areas and especially among road workers (30%). Results from the 1999 Nutrition Survey indicate that on average, children from eastern Bhutan were nutritionally worse off than those from other regions.

Causes of increasing demand of cereal per RNR Statistics 2000, MoA, RGoB

- Rapid growth of population
- Emergence of an urban non-farming community
- Rise in per capita food consumption and
- Change in food consumption pattern – from maize & buckwheat to rice

The task of reducing poverty and food insecurity is quite challenging for Bhutan. The country has a subsistent agrarian economy where agricultural production has not been flourishing due to limited availability of cultivable land, poor soil

[7] Current Development, WB
[8] Cited in UNICEF Bhutan, *A Situation Analysis of Children and Women in Bhutan, 2000,*Thimphu.

quality, and low cropping intensity, labour shortage in the farms and a shift in the production of cereals for self consumption to production of cash crops. Bhutan's domestic food production is declining and failing to meet the increasing food demand inside the country, therefore, yearly imports of food is rising to fill up the food gap.

Bhutan's Ninth Plan has identified the scarcity of arable lands as one of the major causes of food insecurity[9]. The Plan also identifies inaccessibility to goods and services as another major cause of poverty. The RGOB strongly emphasizes the construction of new roads, community schools and boarding schools. The PAA 2000 revealed that poor access to roads and transports, size of land holdings, rural electrification and communications are some of the critical constraints in expanding economic opportunities for the poor and the vulnerable.

The RgoB's Poverty Assessment Report 2004 has established for the first time a consensus on the idea that some people live in poverty in Bhutan.

1.1.3 Efforts towards reducing poverty and food insecurity

In Bhutan, poverty reduction has been an integral part of the development thrust of the Government in all the Plans. The national development targets as reflected in the Ninth Plan and Vision Bhutan 2020 closely match the Millennium Development Goals (MDGs) and stand as a testimony of a strong national political commitment to socio-economic development and GNH which try to bring the people not only above the poverty line but also to ensure a better quality of life.

> "Improving quality of life and income, especially of the poor" is one of the five overall goals of the Ninth Five Year Plan (2002-2007).

The Royal Government of Bhutan has always addressed the food security issue not directly through food aid, but through overall growth strategies and social services. Some of the exemplary steps taken by RGoB to improve the poverty and food insecurity situation in the country include the resettlement of landless people, health and nutrition programmes, establishment of the Food Corporation of Bhutan under the Ministry of Agriculture to stabilize market prices and to coordinate food storage and distribution, increased public expenditure on farm, feeder roads, rural electrification and rural development.

[9] Ninth Plan Main Document (2002-2007), Planning Commission, Royal Government of Bhutan

The only provider of food aid in Bhutan is the WFP. The United Nations World Food Program (WFP) operates in Bhutan to provide food aid assistance to the food insecure areas. The WFP projects, which commenced in 1976, are spread out across the country. Earlier the assistance was focused on seven priority areas of economic and social development, viz. health, education, agriculture, irrigation, cereal price stabilization scheme, roads, suspension bridges and mule track construction etc. WFP today is involved in education, the road sector and in improving rural access through the Ministry of Agriculture. Since the resources are scarce, there is a need to analyze those most in need and to be able to target WFP food aid to the needy.

1.2 Need for geographical targeting to reduced food insecurity & launching of VAM

In case of Bhutan, the spatial disparity in the intensity, depth and severity of poverty and food insecurity is quite predominant throughout the country. To eradicate poverty and food insecurity, it is important to identify the geographical areas where high levels of poverty and food insecurity prevail. This is also helpful for efficient targeting of scarce resources. Vulnerability Analysis and Mapping (VAM) was introduced within WFP to help country offices identify geographical areas vulnerable to food insecurity through a Standard Analytical Framework.

Having been successfully used and applied in many countries, WFP Bhutan office felt that VAM would be a useful tool to identify geographical areas vulnerable to food insecurity in Bhutan. Besides, considering the government's current emphasis on understanding and addressing issues such as food security and poverty in the country, VAM comes as a timely tool that could be of great help to Bhutan's decision makers.

With government endorsement, it was decided to implement VAM as a collaborative activity between WFP and the Ministry of Agriculture of Royal Government of Bhutan. The Policy and Planning Division of the Ministry of Agriculture was identified as the focal point of this project.

1.3 Approach used in the study: The WFP model of food security & vulnerability

FAO (1983) had formulated the basic concept of food security defined as "all people at all times have both physical and economic access to the basic food that

they need". Later the concept of food security that was modified in the World Food Summit in 1996, "a situation in which 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".

Food insecurity can be of two types: chronic and transitory food security. Chronic food security reflects continuous and inadequate diet caused by the inability to acquire food. It affects the household that persistently lacks the ability to produce their food or purchase food. Transitory food insecurity is defined as a temporary decline in the household's access to enough food. It results from instability in food prices, food production and household income. In its worst form, it produces famine. Long term transitory food security can lead to chronic food insecurity.

Thus food insecurity here is analyzed in terms of availability of food, access to food and utilization of food. Availability of food generally refers to production and physical availability of food in a given area. Access refers to economic access to food that is the purchasing power of the people concerned, and utilization refers to proper use and consumption of food commanded by a household and its members from their entitlement. Food availability is a community level concern, its access is a household level concern and utilization is an individual level concern.

Vulnerability is defined as the probability of an acute decline in food access or consumption levels that expose people to food insecurity. The two major components of vulnerability are exposure to risk and ability to cope with it. According to this definition, the inability to cope with a variety of risks may affect household's food security. A straightforward way of measuring vulnerability is livelihood security.

The above paragraphs outline four components or dimensions of food security viz., availability, access, utilization and vulnerability. The present study has also been based on the four components of food security/insecurity.

1.3.1 Study unit

The geographical unit at which VAM analysis could be prepared depends on the availability of data. Bhutan is divided into 20 dzongkhags. Each dzongkhags is sub-divided into geogs. Altogether there are 201 geogs in the country (Annexure A). For an accurate and micro level targeting, WFP along with MoA decided to select lower level geographic areas i.e. geogs as the unit of analysis.

1.3.2 Objectives of the study

The study has two major objectives.
Firstly, to prepare a food security map of Bhutan displaying the spatial variation of vulnerability of geogs to food insecurity.

Secondly, produce a report characterizing food security by dzongkhags/geogs based on the score sheet results that have captured local knowledge on food security situation, and official data available from different census and surveys.

It is expected that the map and the report will be a guideline not only for WFP but also for RGoB in prioritizing vulnerable geogs for development interventions.

1.3.3 Methodology

There are well-recognized and recommended indicators for studies on vulnerability to food insecurity analysis. But for many countries, data for these indictors are lacking. Therefore, many of these indicators have to be either excluded from the analysis or replaced by proxy variables.

1.3.3a Data collection on proxy indicators

To identify the food security status of Bhutan at geog level, information on proxy indicators were collected through two types of data collection methods, secondary data collection and primary data collection.

Initially fifteen proxy variables representing availability and access components of food security were selected from the secondary data sources that the RGoB maintains. Indicators on utilization were not available from the official databases.

For primary data collection “Knowledge Based Scoring” or KBS was applied (Annex B). This method, previously used in Sri Lanka, is a sort of rapid appraisal where information on food security indicators is collected through assigning scores to the indicators by a group of people with knowledge on the local food security situation. This primary data gathering method is very handy when there is time constraint; it is helpful in filling the information gap in the secondary database and in assessing the outcomes of secondary data analysis. For Bhutan, the method comprised two questionnaires.

The first questionnaire contained 23 structured questions on availability, access and utilization indicators. These questions were of two categories; the first thirteen questions on availability and access component were to be scored based on respective scorers' best knowledge. The scoring system ranged from one to five, where one indicated the worst situation and five the most satisfactory. The rest of the questions asked for numbers or percentage on the issues, which also had to be filled up based on best knowledge. The questionnaire contained open-ended questions on frequency and intensity of different types of hazard, on social dynamics of food insecurity, on different groups of people who are exposed to food insecurity, on indicators of food insecurity in the context of Bhutan and intervention opportunities.

The staff of MoA and WFP held workshops in all the dzongkhags throughout June 2005. The sector heads and field staff from different sectors -- agriculture, livestock, forestry, education, health and planning -- participated in the workshop and, rated all the questions in the KBS sheet for each of the geogs within that particular dzongkhag. Thus 201 KBS sheets were filled up and the data were entered. The second questionnaire comprises open answers to the questions and the data entry had to be coded.

1.3.3b Data Analysis

Both the primary and the secondary data sets were stored, cleaned and analyzed using a statistical analysis package called SPSS. Through some trial and error method, finally 10 indicators from the secondary database and seven indicators from the KBS were selected. These 17 indicators (page 14) were found to be suitable in explaining the availability to food, access to food, utilization of food and hazard situation --the four components of food insecurity.

To derive a composite food insecurity index for the country, a multivariate statistical analysis called the Principal Component Analysis or PCA was run on the 17 indicators.

Chapter 3 contains details of the construction of a composite food security index using the indicators and mapping the results.

1.3.3c Limitations & strengths of the study

The major limitation of the study is unavailability of some very important indicators to assess and map the food security situation in Bhutan. Geog level

estimates on the following issues can improve and fine-tune the assessment and the vulnerability to food security mapping.

i. Rural to urban migration leading to labour shortage in the rural areas.
ii. Crop damage by wild life and pests.
iii. Household level food storage capacity.
iv. Household level food shortage.

The secondary databases that have been used here are mostly derived from the RNR 2000 census that has some limitations. The census achieved 87 percent coverage only. The primary sources of data for the census were collected from farmers who were not educated and did not maintain farm records. Therefore, data precision depended mainly on their memory recall[10].

The Knowledge Based Scoring method that was used to collect information on food security from the field is also perception based where bias and ignorance on the issues can skew the responses although enough measures were taken for the KBS surveys. Each of the geogs were well represented by sector heads from different sectors like planning, education, agriculture, livestock, forestry, health and the rural credit scheme to provide accurate information on the issues incorporated in the Knowledge Based Score sheet. Though the KBS does not cover many detailed aspects of food insecurity, in terms of rapid assessment, it was able to capture an overall scenario of food insecurity.

All of the previous food security or poverty mappings that had been done in Bhutan were based on only secondary data sets produced by the government. The present food insecurity and vulnerability mapping is the first of its kind in Bhutan that tries to fill the lack of secondary data sets by incorporating field based information. Both the data sets complemented and supplemented each other and provided a food insecurity scenario on the country that is more close to ground reality. Obviously a hundred percent accuracy can never be expected in any sort of statistical analysis.

However, the map of Bhutan's vulnerability to food insecurity is one of the tools to target food insecure areas for planning or introducing any development activities or interventions. This targeting mechanism can be further refined by taking up household level food security surveys in the very high and high food insecure geogs. This map also requires updates with the span of time and with availability of reliable data on food security indicators at geog level.

[10] RNR Statistics 2000, MoA, RGoB

Chapter II

2 A brief overview of the food availability, access and utilization situation in Bhutan

This chapter provides an overview of the food security and vulnerability situation of the country. The overview is guided by major components of food security viz. availability access and utilization. The overview mainly draws upon the food security scenario that has been depicted in different official reports and censuses including the BLSS 2003, RNR Statistics 2000, PAA 2000, and Statistical Year Book of Bhutan 2002, 2003 and other secondary information.

2.1 Availability of food

Availability of food depends on the supply of food which can be in the form of domestic production, imports or aid/donations.

2.1.1 Supply of food grains through domestic production

Bhutan has traditionally been self sufficient in cereal productions[11]. Cereals comprise paddy, maize, wheat, barley, millet and buckwheat. Rice and maize are the principal food consumed by the Bhutanese people and these two crops jointly account for 90 percent of the total cereal production. Major paddy cultivation areas are found in the west and the south where terrain is gentle and more accessible to streams and river valley irrigation systems.

Punakha, Sarpang, Samste, Wangduephodrang, Paro and Tsirang are the largest paddy producers. Together they contribute 61 percent of the total paddy production in the country. Maize production predominates in the eastern dzongkhags and 72 percent of the total maize production comes from six eastern dzongkhags (RNR 200 Census).

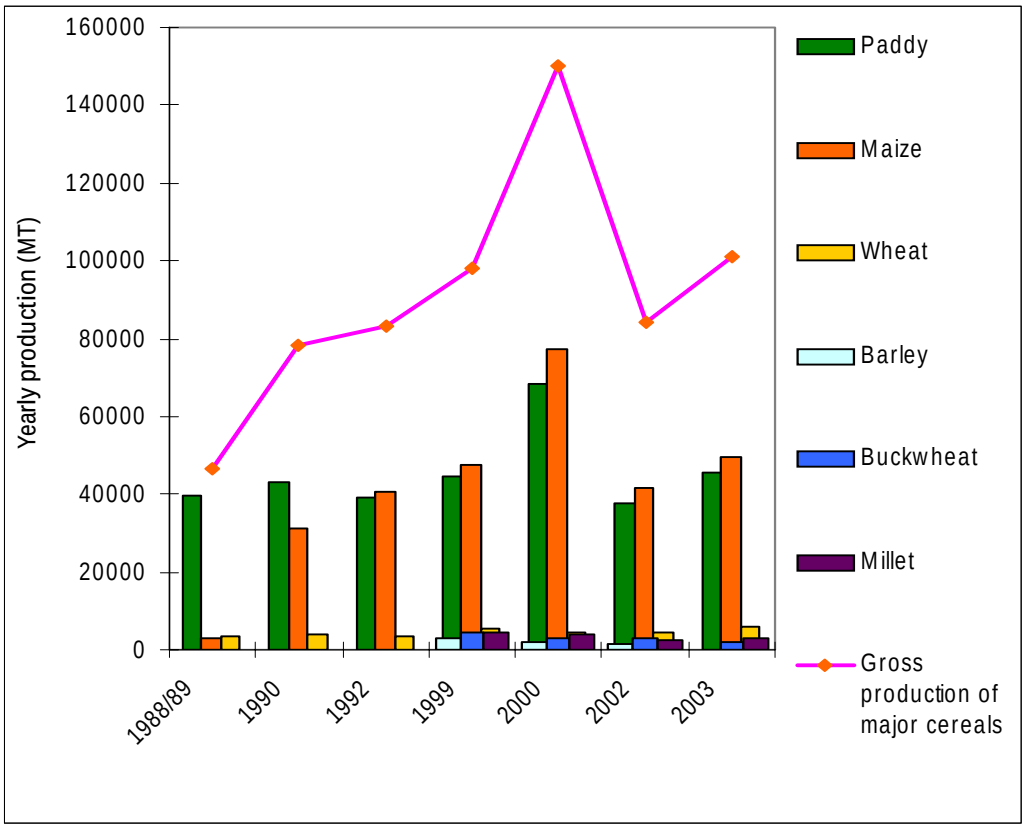
Cereal production is largely for personal consumption, with marketable surpluses varying within the 4.5 percent to 4.8 percent range. Cereal self-sufficiency The RNR 2000 report estimates cereal self-sufficiency at 65 percent with a target to reach 70 percent by the end of 2002.

From the cereal production over last several years, it can be easily discerned that the food self sufficiency level for Bhutan has not improved particularly when

[11] Walking the Extra Miles, RNR Selected Statistics 2003, MoA, RGoB

compared to the demands by the growing population. During the 1996 Census, the population of Bhutan was 600,000 and in the year 2004, the estimated population based on a 2.5 percent growth was 752,700. The population has increased by 0.15 million over a period of eight years, but the domestic supply of food grain does not seem to be keeping pace with the domestic demand. Figure 1 shows mainly the gross supply, and if actual or net supply is considered the figures depicted here will go down by 20 to 30 percent taking into account the post harvest losses, feed, seed etc.

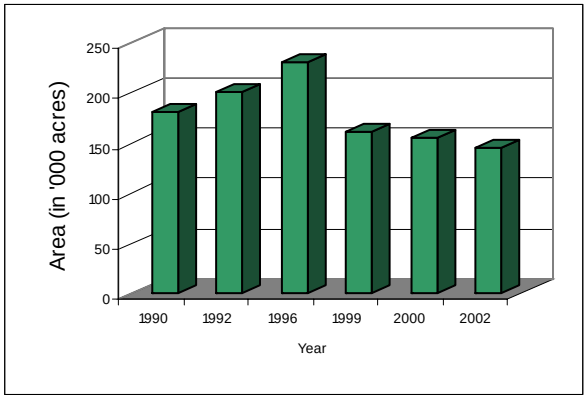
Figure 2: Cereal production in Bhutan



Note: Empty cells in the table means data were not available.
Data Source: 1988/89 data derived from Statistical Year Book of Bhutan 2002; Agronomic Survey, CSO 1990 & 1992; Post Enumeration Survey ,CSO 1994; RNR Survey1999; RNR Census 2000; RNR Sample Survey 2002; RNR Sample Survey 2003

Agricultural area under cereal cultivation also seems to be steadily declining since 1996. These data convey serious concerns on maintaining food self-sufficiency targets in the country.

Figure 3: Total areas under cereal crops



The domestic cereal production in Bhutan gets completely absorbed by the rural sector, while urban requirements for cereals are met through imports. The import of cereals is largely attributed to the presence of immigrants in the country[12]. The immigrant populations are comparatively marginal in rural Bhutan. Moreover, the increased rate of rural to urban migration has added more numbers to the urban population while villages are running out of manpower. The impact of such migration has resulted in the underutilization of agricultural lands and reduced food production, but it has increased demand for food from the non-agricultural population living in the urban areas.

2.1.2 Supply of livestock products

Dairy and livestock products are also an important form of food diet in Bhutan and substantial amounts of the total livestock productions are produced at subsistence level. The RNR 2000 Census shows that about 25,000 MT of milk are produced out of which 83 percent are processed for butter and cheese, 15 percent are directly consumed and only 2.00 percent sold.

In the year 2000, a total of 1,700 MT of meat (beef, mutton, pork and chicken) were produced, of which 59 percent were consumed. It is to be noted that the figure on meat consumption is lower here as the amount only represents the production from farms. Generally speaking, production of meat over the years has mostly remained stable. Religious inhibition in slaughtering animals, inadequate processing and cold storage facilities, and high transport costs for marketing meat are some of the leading constraints to large-scale meat production. Among the

[12] Ura Karma, A Brief on Food Security, June 2005, an unpublished article submitted to WFP

dzongkhags, Trashigang, Wangdue, Chhukha and Samtse are the largest producers of livestock products.

2.1.3 Supply of food through import

The food gap in Bhutan is met through import of food grains particularly from India. The imports in Bhutan are transacted either by FCB or private sectors. Rice is the major food commodity imported and the imports have increased from 31,200 metric tons in 1995 to 34,814 metric tons in 1998, and to 49,899 metric tons in 2003[13]. The import of wheat / wheat flour has also increased over the years[14].

There also has been a rapid increase in the import of the livestock products, which implies that demand for meat is also increasing. The scale of livestock products imported into the country is much higher than live animals imported for slaughtering.

Table 1: Quantity of processed meat imported[15]

Year	Beef (ton)	Pork (ton)	Chicken (ton)	Fresh fish (ton)	Dry fish (ton)	Egg (cart)
2002-2003	2,539	1,103	914	455	761	259
2003-2004	2,494	980	965	501	1,159	243

2.1.4 Food grain shortage at household level

The RNR Statistics on selected indicators 2002 stated that 49.5 percent of the rural population was able to produce enough food grains to last the whole year. According to the indicators, 50.5 percent said that their production lasted on an average nine months leaving about three months in which they had to rely on other sources like borrowing from neighbours, bartering with livestock or livestock products or selling labour in exchange of food. In terms of overall household food grain shortage, food security is especially critical in geogs such as Laya, Lunana, Soe, Naro, Lingzhi, Merak, and Sakteng where people are dependent on the food grain supply from the lower valleys which is aggravated by highly inaccessible conditions[16]. If considered by dzongkhags the RNR census

[13] Dept. of Revenue and Customs, 2003
[14] Ibid
[15] BAFRA Agricultural Progress Report, 2002-2003 & 2003-2004
[16] RNR Census 2000

2000 & RNR statistics 2002 show that more than 60% of the households in Haa, Chhukha, Samste, Gasa, Tsirang, Bumthang, and Sarpang experience food grain shortage.

Non-wood forest products are also important sources of food supplements for many households. A study undertaken in early 1993 in Trashigang and Samdrup Jongkhar showed that most villages depend on the forest for a variety of foods. In some dzongkhags, the food collected from forests is limited to mushroom.

2.2 Access to food

Availability of food in a region does not ensure food security until and unless the people can access the food. Access to food is a very important component of food security, which is mainly governed by factors like purchasing capacity of the households, their access to the markets and other facilities which is again related to communication systems like roads and public transport. The access issue has been represented here by proxy indicators like employment status, access to school and public services.

2.2.1 Employment status

The following table shows the job status of the household heads who are expected to be the main income earner for the family. The overall scenario seems to be a lot improved in the urban areas compared to the rural areas. The incidence of poverty for household heads who are looking for work in rural areas is the highest at 93.6 percent though they constitute only 0.3 percent of the population share. This is followed by those who are not in the labour force and who are underemployed at 43.6 percent for each of the jobs described. Unlike household heads looking for work, the other two categories have 13.7 percent and 21.1 percent of the population share respectively. In rural areas, the incidence of poverty is also alarming for the agricultural workers which represent 72 percent of the rural population and has a poverty rate of 39.5 percent.

Table 2: Poverty incidence for selected groups by characteristics of the household head

Characteristics of household heads	Population share		Poverty rate	
	Urban	Rural	Urban	Rural
Working	92.2%	81.5%	4.3%	36.9%
Looking for work	0.4%	0.3%	0.0%	93.6%
Not in labor force	2.9%	13.7%	0.9%	43.6%
Has a secondary occupation	2.1%	4.9%	1.6%	33.7%
Not working	4.4%	4.6%	5.2%	43.0%
Agriculture	2.4%	71.9%	3.2%	39.5%
Industry	8.5%	1.4%	5.7%	22.4%
Services	81.3%	8.2%	4.2%	16.7%
Under employment (Working less than 20 hours per week)	9.1%	21.1%	3.8%	43.6%
Government	57.2%	3.3%	5.4%	5.5%

Source: BLSS 2003.

2.2.2 Access to roads & public services

Lack of road and transport facilities are considered to be one of the constraints affecting food security at household level as the rural people are restricted from availing other public facilities. Access to roads has greatly improved since the formulation of the Comprehensive Food Security Program in 1994. It was then observed that the majority of the rural population lived at least half a day's walking distance from the nearest motorable road. By 2000, only about 10 percent of farm households were found to live more than eight hour's walking distance from a motorable road, 40 percent lived within an hour's walking distance and another 31 percent lived within 3 hours walking distance[17].

The poor, especially in remote rural areas, have difficult access to services. Rugged terrain and low population density in Bhutan result in difficult access to public facilities and services for the rural population. For instance, 64 percent of the populations live more than an hour away from a food market, 60 percent from the availability of wood, 63 percent from a health center, 83 percent from the district headquarters, and 70 percent from a bus station. Approximately 45 percent of those in remote areas live in poverty, as opposed to 38 percent for rural areas as a whole. This supports the statement that remoteness together with unavailability of service facilities has an impact on the poverty and food security status.

[17] Information on access to motorable roads taken from RNR census 2000

Table 3: Incidence of poverty in rural areas for those living more than one hour away from various facilities.

Distance to facility	Population share	Poverty rate
Time to post office	60.2%	44.3%
Time to BHU	63.1%	44.6%
Time to drugstore	23.5%	41.1%
Time to district headquarter	82.5%	42.1%
Time to wood	51.9%	34.9%
Time to tarred road	60.7%	47.0%
Time to feeder road	25.9%	47.8%
Time to food market/shop	64.3%	44.4%
Time to agricultural/ livestock extension center	59.5%	44.2%
Time to bus station	70.6%	43.8%

Source: BLSS 2003.

The same survey estimated that 73 percent of rural households did not have electricity and 97 percent were without a telephone.

This situation reflects the fact that the scattered population and much of Bhutan's steep topography remains a severe constraint for the expansion of road networks, which in turn is essential for the provision of basic utilities such as electricity and telephone connections. Given the cost of construction and maintenance, it is expected that for a large segment of the rural population, even in the longer term, distances from roads will continue to be measured in hours, and access to basic facilities will be constrained.

2.2.3 Access to education

Access to basic education contributes to the well-being of the population and enhances their opportunities. With a national literacy rate of 43 percent, impressive achievements have been recorded in urban literacy with more than 80 percent of the urban population literate whereas the rural literacy is only 37 percent[18]. Since the overall educational attainments in Bhutan are quite satisfactory in the urban areas this section will focus on the rural education.

According to the BLSS 2003 the gross enrolment rate in primary education is almost 93 percent. In the lower secondary level, it is 56 percent. The PAR report

[18] BLSS 2003

2004 estimated that the primary school net enrolment rate for boys is 70 percent and for girls, the rate is 62 percent. The report also showed that participation rate in primary schools is 70 percent though the figure varies for the poor and the non-poor children of 6 to12 years of age. The attendance rate for poor children is 60 percent and for the non-poor children, it is 77 percent. Considering the gap between the poor and the non-poor attendance, the attendance of the poor children is quite appreciable and indicates a rising awareness among the poor people on giving their children basic education. Besides the existing current educational policy of achieving universal enrolment in primary education, basic education has become within the reach of many. The major reasons that were identified for not attending school were mostly related to economic factors like "can not afford" or "needs to work"[19].

The geographical variation in the participation in primary education is also quite prominent. The western region has the highest school participation rate among the 6 to 12 year old children; this rate is lowest in the central and the eastern region[20].

The educational attainments of the household head show that about 77 percent of all the household heads have had no schooling. About 10 percent had some primary schooling, while about 12 percent have had some secondary schooling.

2.3 Utilization

Proper utilization of food is reflected in the nutritional status of a country. Intake of a balanced diet is also a matter of knowledge and awareness of the nutritional components of the food basket. Thus, educational attainments can also be a proxy indicator to judge the food utilization pattern in a country.

2.3.1 Nutrition

The national average calorie intake calculated on the basis of the assumed food basket was estimated to be 2,555 kilocalories per day per person, whereas Bhutan's poverty level was set at a calorie requirement of a minimum of 2,124 kilocalories per day.[21] National aggregate figures obscure significant differences between the regions. The per capita cereal consumption level in 1990 was 222 kg. a year, while estimates in 2002 indicate a decline to about 214 kg. a year. The

[19] ibid
[20] PAR 2004
[21] Poverty Analysis Report 2004,

simple reason could be the switch over of dietary habits of people to other non-cereal commodities.

A rough estimate of food consumption in the food insecure dzongkhags shows that the daily calorie intake per capita averages 1,883 kilocalories, 26 percent lower than the national average. The calorie intake is particularly low in the dzongkhags of Pemagatsel, Trashiyangtse, Samdrup Jongkhar and Gasa. This data appears to partially confirm the findings of a nutrition survey which concluded that under nutrition among children less than five years old is more prevalent in the southern dzongkhags.

The National Nutrition Survey of 1988/89 stated the findings of a nation wide study undertaken to provide baseline data on a range of nutrition-related disorders in children aged 0 to 5 years and women aged 15-45 years. The report showed that the prevalence of stunting among children aged 0 to 5 years is significant in Bhutan. According to a report, this prevalence may be an indication that a considerable proportion of children experience long-term (possibly low grade) malnutrition, possibly related to diarrhoeal episodes. The findings were that in children 0 to 5 years, 56.1% were short for their age, 37.9 percent were underweight for their age, and 4.1 percent were underweight for their height. There were no significant differences in the incidence of stunting between male and female children. However, both male and female children in the southern border districts and in the eastern zone were found to have a significantly higher prevalence of stunting. The study stressed the need for education in personal hygiene and a healthy diet to reduce stunting in children.

Table 4: Summary of nutritional indicators

Indicator	1980s		1990s	
	Year	%	Year	%
Low birth weight	-	-	1998	13.5
Under weight (weight for age)	1988	37.9	1999	18.7
Stunting (Height for age)	1988	56.1	1999	40
Total goiter rate	1983	64.5	1996	14
Iodized salt coverage (>15ppm)	1983	-	1996	82
Vitamin A deficiency (sub-clinical)	1985	14	1999	2.6
Iron deficiency Anemia (Pregnant women)	1985	60	-	60

Source: Annual Health Bulletin 2002

The National Nutritional Survey 1988/89 also confirmed the continued prevalence of malnutrition, indicating the following rates of stunting, underweight and wasting by geography (zone) and age group.

Table 5: Malnutrition prevalence in children (percentage by zone)

Zone	Stunting	Underweight	Wasting
South	56.8	44.9	12.8
West	49.8	29.4	7.4
East	65.5	33.3	6.7
Urban	44.7	33.0	6.0
Central	53.6	27.1	6.1

Source: National Nutritional Survey 1988/89

Though these data were recorded 16 years ago, the findings of a national anthropometric study undertaken in 1999 showed that while the incidence of stunting had improved, its prevalence was still very high. The indication was that a considerable number of children were experiencing long-term malnutrition, possibly related to infection, lack of adequate treatment, and inadequate food both in terms of quantity and quality.

Chapter III

3 Mapping of Vulnerability to Food Insecurity in Bhutan

3.1 Selection of appropriate indicators for the mapping

One of the major objectives of this study is to classify the geogs of the country according to the vulnerability to food insecurity through a rapid analysis of secondary and primary data on "availability", "access to", and "utilization" of food. Initially 15 secondary indicators reflecting geog wise variations on the availability and access to food were selected from the RNR census and surveys. Through trial and error method some of the highly correlated and overlapping indicators were dropped from the list just to avoid the overcrowding of indicators. Finally it was possible to identify 10 indicators from the secondary database useful for the analysis.

However, the availability of a number of indicators capable of explaining variations of vulnerability to food insecurity across the geogs from official data sources is very limited. The ten indicators that have been selected did not contain the variables that explain the utilization of food, which is an important component of food insecurity. To fill such gaps, 7 more indicators were selected from the Knowledge Based Score sheet and finally a set of 17 variables were ready for analysis.

Most of the KBS indicators that have been selected are the proxies that explain the utilization scenario in Bhutan. For indicators like access to electricity and transport facilities KBS information was chosen over the secondary data on the same variables as it provided more recent information. In the secondary data set, another important indicator on food insecurity – the geog wise health facility -was missing. This indicator was also taken from the KBS sheet as one of the proxies to explain access to food.

The following table 6 reflects the indicators that show variations in the availability and access, utilization and hazard components of food security. The indicators are extracted from official data sources and KBS for the analysis..

The indicators on the food availability mainly cover agricultural land related issues like different types of agricultural land (wet & dry) available at household levels. Land availability is also an indication of agricultural production as well as

availability of food grain. Besides food grain availability, fruits and dairy products have been incorporated through indicators like fruit growing households, and the availability of livestock products like meat, milk, butter, cheese, eggs etc.

Availability of food in an area does not ascertain food security as long as people cannot or do not access the food. Food can be accessed in the form of subsistence production, purchase, food aid or donation. The access to food indicators used here are proxies for income, wealth and asset status of the household and the area. Households with better housing, more monetary crop and livestock, with better facilities like access to safe drinking water and better road systems tend to be food secure.

Improved road and communication system facilitates the marketing of agricultural produces that build asset or wealth. Average slope is related to the productivity of the agriculture sector and also to the development of road communication, thus, slope indirectly influences access indicators. Household's asset ownership always helps them to fall back on a buffer during periods of food shortage.

Indicators on utilization emphasize the nutritional status. An unhealthy sick person or child cannot absorb the food properly. This can lead him/her to further illness. Educational attainment is a good proxy for utilization as education provides knowledge and awareness on nutritious dietary intake. Availability of electricity widens up options for cooking fuel which has an impact on the food consumption patterns and, thus, on the nutritional status.

Table 6: List of selected indicators by source

Availability of food	
1. Average cultivable land area per household	RNR survey, 1999, 2002, 2003 & RNR Census 2000, MoA
2. Percentage of households owning wet land	RNR Census 2000, MoA
3. Percentage of households owning dry land	RNR Census 2000, MoA
4. Percentage of household growing apple & orange	RNR Census 2000, MoA
5. Availability of livestock product	KBS
Accessibility to food	
6. Average number of monetary livestock unit per household	RNR survey, 1999, 2002, 2003 & RNR Census 2000, MoA
7. Average livestock production monetary value per household	RNR survey, 1999, 2002, 2003 & RNR Census 2000, MoA
8. Average crop production monetary value per households	RNR Census 2000, MoA
9. Percentage of households having access to safe/piped drinking water	KBS, June 2005
10. Percentage of households with permanent roofing material	KBS, June 2005
11. Health facilities	KBS, June 2005
12. Transport facilities	KBS, June 2005
13. Weighted average slope	MoA, 2000
Utilization of food	
14. Percentage of eligible children (5-15 years age) not attending school	KBS, June 2005
15. Total number of government primary to high schools	KBS, June 2005
16. Percentage of households with electricity	Ministry of Trade & Industry, 2004
Indicators on Hazard	
17. Extreme weather shocks	KBS, June 2005

3.2 Methodology for food insecurity mapping

3.2.1 Data analysis for mapping vulnerability to food insecurity

The values of the above indicators for the 201 geogs were analyzed in SPSS (Statistical Packages for Social Scientists) to classify the geogs according to the vulnerability to food insecurity.

The first step in the analysis was cleaning up the data to make sure the data file is free of errors, missing values and unexplainable outliers. Descriptive statistics of each and every indicator were examined thoroughly for this purpose. After cleaning data file with respect to missing values, outliers etc. indicators were transformed so that higher values of all indicators corresponds to better and lower values correspond to poor situation with respect to the vulnerability to food insecurity.

The level of vulnerability to food insecurity of one geog is different from the other due to the differences of their values of the selected 17 indicators. As such, the inter-relationship of the indicators has to be analyzed in classifying the geogs according to the vulnerability to food insecurity. Classification cannot be done by analyzing indicators one by one. These indicators need to be reduced to one indicator while retaining the important characteristics of the original indicators. Correlation analysis was used to see whether the indicators are correlated. As they were correlated to some extent, a variable reduction method - namely Principal Component Analysis- was applied. The strengths of PCA are as follows:

i. it counts the independent indicators from a crowd of indicators;
ii. it puts a higher weight to indicators that show maximum variation and;
iii. it can reduce huge numbers of indicators into a manageable number of factors.

3.2.2 Extraction of factors

The Principal Component Analysis is a tool that was applied to reduce the number of indicators into a manageable number of factors (linear combinations of original indicators), and finally to reduce it further into a single index known as Food Insecurity Index. The Varimax rotation method was applied so that resulting factors are not correlated. The criterion used for extraction of factors is to extract factors with Eigen values greater than one.

The factor analysis extracted 5 factors capable of explaining 61 per cent of the variation of 17 indicators used in the analysis. The first factor alone explained 21

per cent of the total variation of the 17 indicators. The 2nd, 3rd, 4th and 5th factors explain 15%, 9%, 9% and 6% per cent of the total variation respectively (Annex 4).

3.2.3 Derivation of a composite food insecurity index

The Vulnerability to Food Insecurity Index, which is a linear combination of the five extracted factors, was compiled by weighting the extracted five factors by their respective Eigen values; this is a measure on how important these factors are in explaining the total variation. The Food Insecurity Index was compiled as follows.

FI = Factor 1* 0.35 + Factor 2 * 0.25 + Factor 3 *0.16 + Factor 4 *0.15 + Factor 5 *0.1

For each geog there is an index value for food insecurity. Geogs with Vulnerability Index falling into the 1st quartile were classified as most vulnerable to food insecurity while those falling into 2nd, 3rd and 4th quartiles were classified as more vulnerable, less vulnerable and least vulnerable respectively. This classification was presented on a map (Annex 1) using GIS where the geogs falling into these four categories were presented in four different colours, pink represents most vulnerable, blue for more vulnerable, yellow for the less vulnerable and green for the least vulnerable.

3.2.4 Results and discussions

The final map that has been produced through a statistical analysis on the 17 indicators shows most of the geogs along the east and south are most and more vulnerable to food insecurity. This classification indicates a relative food insecurity level that is when some geogs are classified as most and more food insecure, that does not indicate the less and least category geogs do not have food insecurity at all. The difference here is that the intensity of food insecurity is much higher in the most and more categories compared to the less and least categories. In this classification process, 51 geogs were identified as most vulnerable (Annex-5).

The composite food insecurity index values for the geogs were averaged out at dzongkhag level and the following vulnerability rankings for dzongkhags were derived.

If the dzongkhags are also classified into 1st 2nd 3rd and 4th quartile to identify the most, more, less and least food insecurity levels respectively, the dzongkhags ranked one to five would become the most food insecure and dzongkhags ranked six to 10 are the more food insecure. In the food insecurity ranking, three dzongkhags out of first five are in the eastern zone. The dzongkhag with rank one is Zhemgang. Though this district is in the central zone a majority of its geogs classified as most food insecure are situated along the southern edge of the country.

Table 7: Vulnerability to food insecurity by dzongkhags

Rank	Zones	Dzongkhags	Mean PCA Index	Levels of vulnerability
1	Central	Zhemgang	-0.32	Most
2	Eastern	Pemagatshel	-0.32	
3	Western	Wangdue	-0.32	
4	Eastern	Mongar	-0.27	
5	Eastern	Trashiyangtse	-0.27	
6	Western	Gasa	-0.22	
7	Southern	Sarpang	-0.20	
8	Eastern	Samdrup Jongkhar	-0.18	
9	Southern	Samtse	-0.15	
10	Eastern	Lhuentse	-0.14	
11	Western	Dagana	-0.12	
12	Western	Chhukha	-0.02	
13	Central	Trongsa	0.00	
14	Eastern	Trashigang	0.09	
15	Southern	Tsirang	0.11	
16	Western	Ha	0.49	
17	Western	Paro	0.53	
18	Central	Bumthang	0.61	
19	Western	Punakha	0.63	
20	Western	Thimphu	0.82	Least

3.2.5 Verification of the results with other studies and surveys

A great deal of harmonization was found when these results were verified with some national surveys and other studies taken up by different non-government organizations. The incidence of poverty calculated by World Bank[22] based on

[22] Current Human Development Outcomes in Bhutan: Analysis Using the 2003 BLSS, Report No. 32273-BT, World Bank, May 31, 2005

BLSS 2003 on 20 dzongkhags also shows Mongar, Trashiyangste, Pemagatshel, Samste, and Zhemgang to be the first five districts where the incidence of poverty is more than 50 percent. The major difference that was found with the World Bank poverty incidence estimates was in Wangdue where the Bank's poverty incidence was estimated to be quite low while the present study found Wangdue to be a most food insecure area. One of the reasons that has been identified from the peoples' perception on the high level of food insecurity in Wangdue is the wide variation in the concentration of wealth; the rich being very rich and the poor being very poor. The consumption expenditure estimates of the very rich can mask the consumption expenditure pattern by the poor, and can ultimately bring down the poverty incidence.

The results of the National Malnutrition Survey of 1989 and National Anthropometric Study 1999 recorded high levels of stunting and underweight among the children under five years of age in the southern and eastern districts. The main causes of such malnutrition were attributed to diarrhoea as a result of a lack of clean water and sanitation, and poor weaning practices including irregular feeding and the lack of varied diet.

Besides the malnutrition records, the eastern and the southern districts also have high population density relative to other districts. This has resulted into poor population land ratio and low agricultural production.

The food security situation in the eastern districts is further deteriorated by low asset holdings like cash crop production or ownership of monetary livestock. Limited access to markets due to the poor road communication system has prevented the eastern districts from producing cash crops. The only possible transportation here are some mule and power tiller tracts. Most of the geogs are more than an hour away from motorable roads. Moreover, as dry land is the major type of agricultural land in these parts, it also restricts crop production by limiting the production to only a few varieties of crops. Another problem for dry land crop producers is yield. The output of dry land crop depends largely on good weather conditions. Also, production in local dry land farming system is based on only one crop a year unlike in wetlands where there are two crops a year.

Chapter IV

4 Characteristics of Food Security by Dzongkhags: Results of KBS

This chapter deals with the open-ended responses that were provided by the geogs on issues other than availability, access and utilization. These issues are both causes and outcomes of food insecurity, they also have an impact on household level food security. The responses obtained at geog level have been aggregated at dzongkhag level.

4.1 Natural hazards

Natural hazards damage crops, and livestock assets, with major impact on the overall livelihoods of the people. Frequent and severe hazards can cause transitory and chronic food insecurity as it prevents the already food insecure households from stepping ahead. The responses that were received from different geogs on the natural hazards that are affecting the community more frequently, and at a heightened severity, shows that basically two types of hazards occur in most of the geogs on a large scale – i) crop damage by wild animals, insects and pests and ii) landslides. Crop damage by wildlife and pests is seen all over Bhutan though the degree of severity varies from geog to geog.

The following table presents the responses on frequency and severity of the hazards by dzongkhags. The dzongkhags where severity and frequency of hazards are moderate to low have not been presented here.

Table 8: Percentage of geogs severely affected by natural hazards by dzongkhags

Hazard / Dzongkhag	Frequent pests /wild animal attack with increasing severity over the years	Less frequent pests/wild animal attack with increasing severity over the years	Frequent pests/wild animal attack with less or constant severity over the years	Frequent landslide with increasing severity over the years	Frequent landslide, less severe or constant over the years
Chhukha (n=11)	18				
Ha (n=5)		60			
Paro (n=10)	30				
Dagana (n=11)			100		
Samste (n=16)		80			13
Mongar (n=16)	44			6	13
Pema Gatshel (n=7)	100				
Tsirang (n=12)	75				
Samrup Jongkhar (n=11)				37	
Sarpang (n=15)	50				
Tashigang (n=16)	69			19	
Trashiyangtse (n=8)	25			25	
Wangdue (n=15)	67				
Zhemgang (n=8)	100				

Note: n = number of grogs

Pema Gatshel and Zhemgang are two dzongkhags where all the geogs are experiencing frequent crop damage by pests, and the severity of such attacks are increasing over the years. Mongar, Tashigang and Trashiyangtse are also vulnerable dzongkhags as more than 50 percent of their geogs are hit by wildlife attacks and landslides that are frequent and severe. Thirteen percent of the geogs in Mongar have frequent but less severe landslides. Samste is another dzongkhag that is suffering from pest attacks and landslides of varying frequency and severity. The frequent hazards with less severe category have been considered here for the reason that this has an impact on the cumulative damage account of the crops. The geogs in dzongkhags like Thimphu, Bhumthang, Chhukha and Punakha are less vulnerable to natural hazards as attacks by wildlife and landslides do not occur at a significant scale in these areas.

Pre-harvest crop losses seriously reduce agricultural production. One of the major causes of such pre harvest crop loss is the attack by wildlife and pests. The threat of crop damage due to wild life is, in a way, discouraging farmers from operating

fields located far from their homes. Thus, crop damage by wild animal is not only affecting the food security of the households through actual damage incurred, but also by preventing them from growing crops in some of their fields.

Drought, snowfall, floods, hail storm are the other natural hazards that were found to affect some of the geogs of Bhutan but their significance is more localized.

4.2 Social dynamics of food security

The social dynamics of food insecurity is reflected in the interplay of the factors affecting food security that can either improve or deteriorate the food security situation. Not all the people living in the society get exposed to these factors. As the level of exposure to food insecurity varies, so does the groups who gets exposed to the situation.

4.2.1 Groups vulnerable to food insecurity

Nearly 31 percent of the geogs in Bhutan identified children as the most vulnerable group; 16 percent reported pregnant mothers and 11 percent said it is both children and mothers who are exposed to food insecurity. Approximately 35 percent of the geogs replied that everyone in the geogs are food secure.

The responses by dzongkhags shows (Table 9) more than 60 percent of the geogs in Chhukha, Dagana, Tsirang, Wangdue and Zhemgang mentioned children as the most vulnerable to food insecurity whereas more than 60 percent of the geogs in Gasa, Ha, Punakha, Sarpang and Trongsa said that pregnant mothers are more food insecure.

Bumthang, Paro, Thimphu, Trashiyangtse and and Lhuentse can be termed as the most food secure areas since vulnerable groups are nonexistent or almost non existent in geogs under these dzongkhags. On the contrary, more than 90 percent of the geogs in Chukkha, Dagana, Gasa, Ha, Punakha, Samdrup Jongkhar, Sarpang and Trongsa identified either children or pregnant women, or both as groups who are most vulnerable to food insecurity.

Table 9: Percentage of geogs responding on types of vulnerable groups

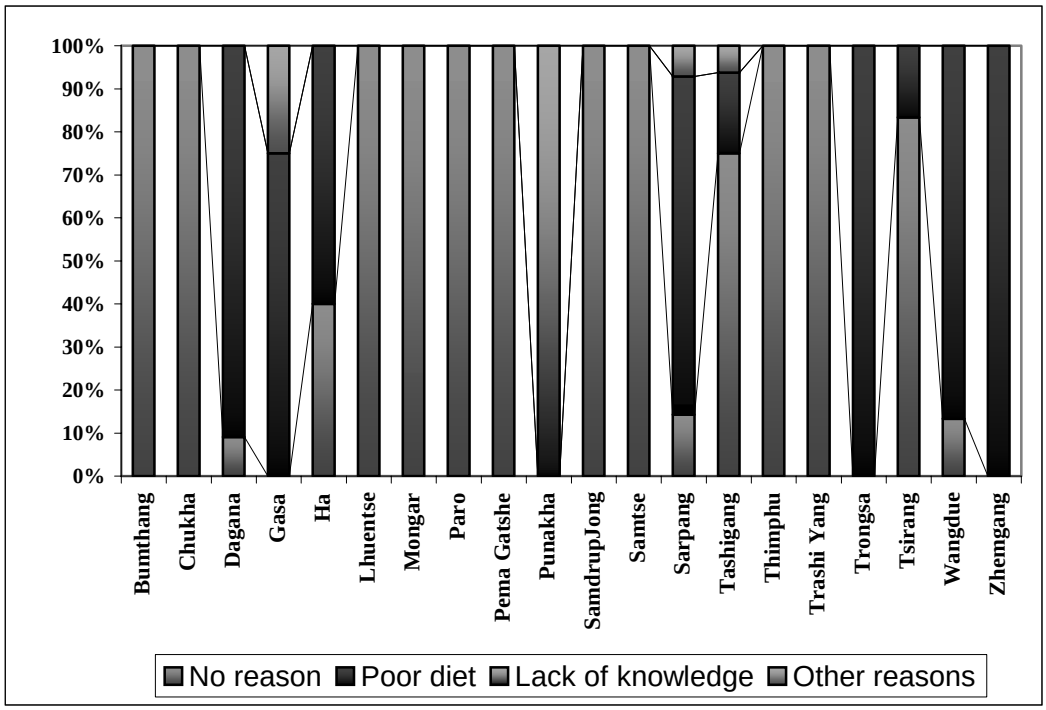
Dzongkhags	None	Children	Pregnant women	Children & Women	Everyone	*Total Vulnerable group
Bumthang (n=4)	100					
Chhukha (n=11)		91	9			100
Dagana (n=11)		100				100
Gasa (n=4)		25	75			100
Ha (n=5)			100			100
Lhuentse (n=8)	75			25		25
Mongar (n=16)	68	13	6	13		32
Paro (n=10)	100					
Pemagatshel (n=7)	57	14		29		43
Punakha (n=9)		44	56			100
Samdrup Jongkhar (n=11)	9	28	18	45		91
Samtse (n=16)	87				13	13
Sarpang (n=15)		15	71	14		100
Tashigang (n=16)	63			38		38
Thimphu (n=10)	100					
Trashiyangtse (n=8)	88			13		13
Trongsa (n=5)		20	80			100
Tsirang (n=12)	25	67	8			75
Wangdue (n=15)	7	80	7	6		93
Zhemgang (n=8)		100				100

*Note: The total indicates the total percentage of responding geogs under children, pregnant mother and children/women category. n = Total number of geogs

4.2.2 Why are the vulnerable groups foods insecure?

The results of the KBS on causes of food insecurity that make people vulnerable to food insecurity has been grouped into three major categories viz. “poor diet”, “lack of knowledge” on the nutritional aspects of the diet and “others” which includes reasons like inaccessibility or remoteness of the area and youth unemployment.

Figure 4: Percentage of geogs responding to reasons of food insecurity **for the vulnerable groups.**



Poor diet and lack of knowledge both indicate malnutrition. These two answers predominate particularly in the dzongkhags where children have been identified as the most vulnerable group.

A good percentage (65%) of geogs stated no reason for food insecurity. Dzongkhags with no reasons also coincides with the dzongkhags in the previous section which stated that no vulnerable groups existed in a high percentage of their geogs.

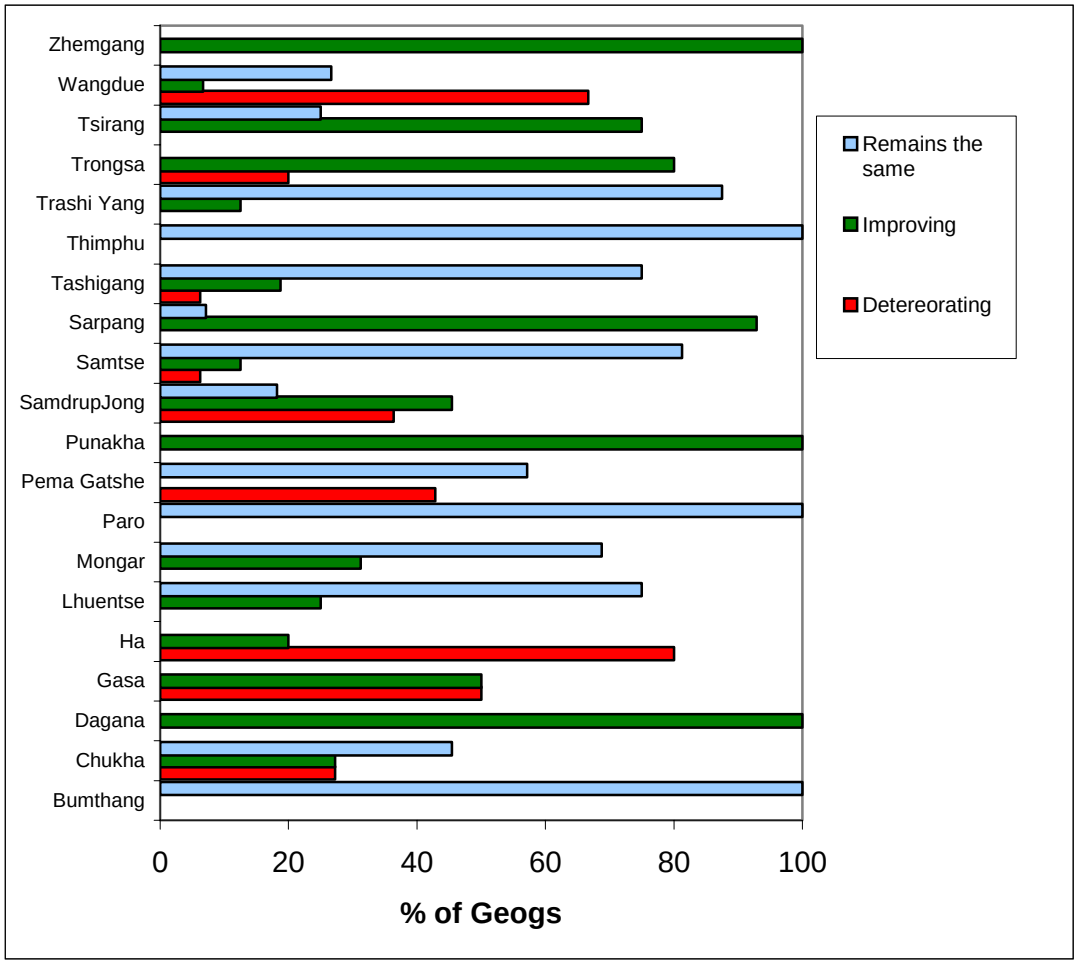
4.2.3 Problem analysis

Food insecurity exists in different parts of Bhutan at varying magnitudes. It is considered a problem when the phenomenon transforms from low incidence to high incidence of chronic and transitory food insecurity. The problem analysis section captures the changing nature and the underlying causes of food insecurity aggregated at the dzongkhag levels.

4.2.4 Changing nature of food security

The changing nature of food security basically implies the shift of the food security status in an area. It should not be misperceived as the absolute food security situation. To what extent the food insecurity situation in geogs and dzongkhags are changing was answered through three categories of responses: food insecurity increasing; food insecurity remains the same or constant; and food insecurity is declining. Almost 40 percent of the total geogs replied that food insecurity has come down, 14 percent responded that it is increasing, and 46 percent of the geogs said that it has remained the same.

Figure 5: Changing nature of food insecurity



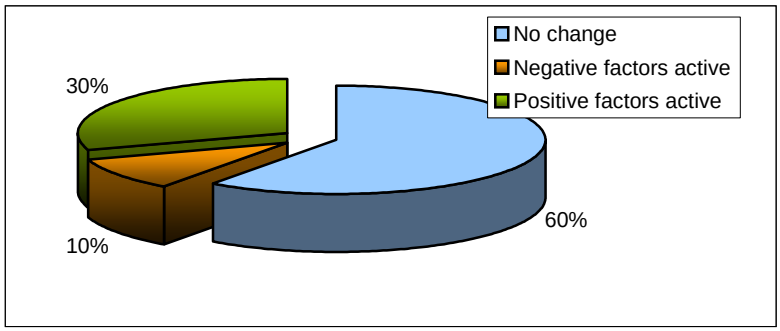
The dzongkhag wise responses show that the food security status is changing for the worse in dzongkhags like Wangdue, Pemagatshel, Ha and Gasa, whereas a majority of the geogs in Zhemgang, Tsirang, Trongsa, Sarpang, Punakha and Dagana replied that their food security is improving. The dzongkhags that replied 'no change' in the food insecurity/security status are the indecisive category as they do not represent the existing food security situation.

4.3 Factors or causes influencing the changes in the food security situation

From the responses in the KBS, six negative factors of deteriorating food insecurity and four positive factors of improving food security were identified.

Negative factors deteriorating food security	**Positive factors improving food security**
1. Population size increasing but agricultural production decreasing. 2. Cash crop production on decline. 3. Agricultural lands taken away for establishment of industries and other developmental works. 4. Rural urban migration. 5. Crop damage increasing due to increased attacks by wild animals and pests. 6. Others: Less crop production, shortage of agricultural land, poor crop variety.	1. Improvements of roads and accessibility. 2. Developmental activities taking place. 3. Awareness & malnutrition status improved. 4. Improved agriculture extension services in the field of advanced technological support to the farmers in form of training.

Figure 6: Changing food security status in the geogs



In total, 30 percent of the geogs responded that the positive factors of food security are more active in the area and only 10 percent replied

that the negative factors of food security are more predominant. The sixty one percent geogs with 'no change' can either be considered as a percentage of geogs with improving food security or as geogs with no food insecurity at all. Chhukha, Gasa, Ha and Wangdue are dzongkhags where more than 40 percent of the geogs mentioned that the negative factors are more interactive in the area.

4.3.1 Underlying causes of food insecurity by dzongkhags

The causes of food insecurity stated in this section are predominant causes that have a great deal of impact on the immediate food insecurity status of the dzongkhags. The causes identified here overlap with the negative factors that deteriorate the food security situation. The difference is in the previous section where the factors mainly influenced the overall changing nature of food security, whereas the underlying causes are the issues that are responsible for the high level of food insecurity in the geogs. Table 10 summarizes the geogs' responses on the underlying causes of food insecurity.

Table 10: Percentage of geogs responding to underlying causes of food insecurity at household level.

Dzongkhag	No cause	Land shortage	Labour shortage/ migration	Low agriculture production	Wildlife attack on crops	Inaccessibility	Others	Total of all causes
Bumthang (n=4)	100							
Chhukha (n=11)	27	18	9	18	18		10	63
Dagana (n=11)	100							
Gasa (n=4)		25		50	25			100
Ha (n=5)			60		20	20		100
Lhuentse (n=8)	88	13						13
Mongar (n=16)	63		19	19				38
Paro (n=10)	100							
PemaGatshel (n=7)	57				43			43
Punakha (n=9)	44				45		11	45
Samdrup Jongkhar (n=11)	45		18		9	9	18	54
Samtse (n=16)	81			6		13		19
Sarpang (n=15)	7				72		21	93
Tashigang (n=16)	56	13		6	6	19		44
Thimphu (n=10)	100							
Trashiyangtse (n=8)	100							
Trongsa (n=5)		20			80			100
Tsirang (n=12)	33		8		58			66
Wangdue (n=15)	20	13			60	7		73
Zhemgang (n=8)					100			100

Note: n = total no. of geogs

Geogs in Bumthang, Dagana, Paro, Thimphu and Trashiyangtse did not identify any causes of food security, as the positive factors of food security are more interactive in these areas. The cause of food insecurity that has been widely repeated by the geogs under different dzongkhags is the damage of crop by wildlife or pest attack. Such damage ultimately leads to low yield and shortage of food grain at household level. More than half of the geogs in Wangdue, Tsirang and Sarpang complained of wildlife attacks. The problem seems to be quite extensive in Zhemgang and Trongsa.

Besides wildlife attack, labour shortage in the agriculture field due to rural to urban migration, shortage of agricultural lands, low crop production and inaccessibility are some important reasons of food insecurity in the geogs. More than 50 percent of the geogs in Chhukha, Gasa, Ha, Samdrup Jongkhar, Sarpang, Trongsa, Wangdue, Tsirang and Zhemgang are experiencing varied causes of food insecurity ranging from land shortage to inaccessibility.

Inaccessibility and land shortage are also the major causes of food insecurity particularly for geogs that are located in remote areas or in high altitudes. In the absence of proper road and communication systems, many households practise only subsistence agriculture as they are not able to carry the perishable agricultural products to nearby markets. Poor road communications has also resulted in low literacy and deprivation from many other facilities and amenities. Households living in inaccessible areas are not sending their children to schools because of the longer time taken to travel to schools.

4.3.2 Indicators of food insecurity

The indicators suitable for capturing the food security situation depends largely on the context of a particular country; often varying from region to region within a country. During the KBS workshops, participants were asked to prioritize a few indicators for each geog capable of assessing the food security situation. The results of those responses are summarized here according to the four major zones.

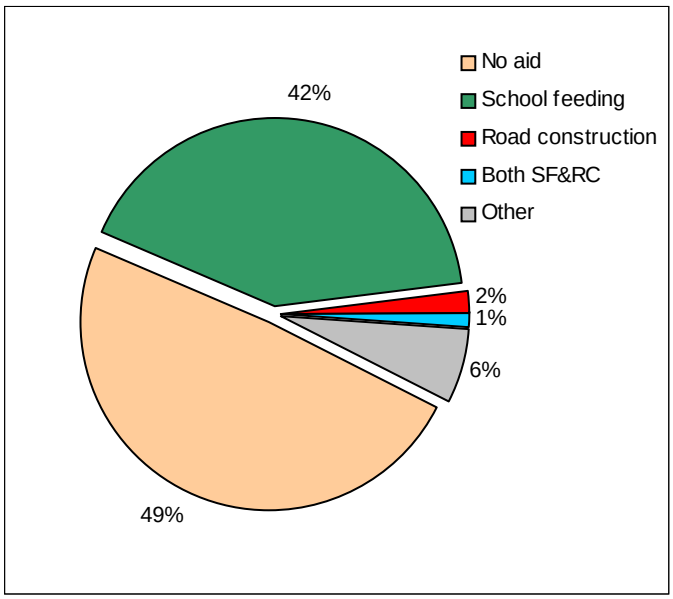
Zones	Few priority indicators	Remarks
Western zone: Thimphu, Paro, Punakha, Ha, Chhukha, Dagana, Wangdue, Gasa	1. Agricultural production/soil fertility/irrigation system 2. Accessibility/communication system 3. Natural hazards/wildlife & pest attacks 4. Labour shortage/ rate of rural to urban migration	In Dagana, 100 percent of the geogs mentioned that the employment rate is a prime indicator for food security assessment
Southern zone: Samste, Tsirang, Sarpang	1. Agricultural production/soil fertility/irrigation/Availability of agricultural land 2. Crop damage by wild life/pests 3. Shortage of labour 4. Malnutrition	
Central zone: Trongsa, Bumthang, Zemghang	1. Agricultural production/soil fertility/irrigation 2. Accessibility/communication system 3. Shortage of labour	Some of the geogs also mentioned crop damage by pests.
Eastern zone: Lhuentse, Mongar, Trashigang, Pema Gatshel, Samdrup Jongkhar, Trashiyangtse	1. Agricultural production/soil fertility/irrigation/Agricutural land availability 2. Accessibility/communication system 3. Malnutrition	

Indicators related to agriculture are quite important in assessing food insecurity throughout Bhutan. In the western and southern parts of the country, crop damage by pests and wild life was found to be an important indicator for assessing food security situation. Shortage of labour is another wide spread issue that is causing food insecurity in the western, southern and central zones. The malnutrition indicator seems to be more a problem for the dzongkhags in the eastern and southern part of the country. This is also supported by the figures produced by the National Nutritional Survey 1988/89 mentioned in Table 4 under Chapter 2. The findings showed that stunting and underweight status among the children is quite acute in the eastern and southern zone compared to the other zones.

The geogs that have mainly complained about the wild life attack seem to be situated closer to forest areas. A majority of the geogs in the Samste dzongkhags reiterated that declining cash crop production is affecting their income earnings.

4.3.3 Food aid received by the geogs

Figure 7: Food aid received by the geogs



Usually, food aid is targeted towards the most vulnerable areas. The response on food aid is another way to assess the vulnerability to food insecurity. The aggregated response on food aid received by the geogs (Figure 6) shows that 42 percent of the geogs received food aid through WFP's School Feeding Programme, 2.00 percent through road construction, and only 1.00 percent through both school feeding and road construction. This road construction mainly covers the Food for Work activity, which is carried out by WFP to construct and maintain the mule tracks and the power tiller tracks.

Nearly half the geogs did not seem to have received any sort of food aid at any time. Gasa, Bhumtag, Lheuntse, Mongar, Pemagatshel, Tashigang, Trashi Yang and Zhemgang are the dzongkhogs where more than 80 percent of the geogs are receiving food aid either through School Feeding or the Food for Work Programme. Most of these areas were targeted for interventions based on situation analyses and VAM studies conducted in the past.

The other category constitutes only 6.00 percent of the geogs in Bhutan which had a school feeding programme prior 1991, or which mentioned that they do receive food aid but could not clarify the type of interventions under which they receive food aid.

Chapter V

5 Conclusion

5.1 Summary of the findings

Bhutan is not self sufficient in food grain production. However, Bhutan has never suffered from an overall shortage in food supply so far. The remaining food gap has always been met by food imports among which rice and wheat are the most important. The import of food grains in Bhutan is used to meet the food demand from urban residents. Bhutan's major strength is its controllable population size; contrary to the growing population experience in many developing countries. Due to the small population size, Bhutan still can spend its export earnings on food imports to meet the internal food grain requirements.

The food insecurity in Bhutan is a combined outcome of access to food, utilization of food and availability of food and natural hazards that are pulling back the overall food security situation. These components are negatively interactive mostly in the eastern and southern parts of the country causing both chronic and transitory food insecurity.

Chronic food insecurity is particularly found in pockets and among particular groups. These groups include the landless farmers who work as farm labour, the labourers who live on daily wages, farmers without sufficient land or livestock holdings, women headed households who either lack sufficient landholdings or work force to generate income. Transitory food insecurity with seasonal food crisis is more common for the rural farmers with small land holdings, the farmers who produce crop completely for their own consumption, and households with low income in the informal sectors and peri-urban areas. Seasonal food insecurity worsens as the food deficit months coincide with the periods of intensive agricultural operations, including tilling and planting when the food need of the workers are higher than in normal times. One of the major causes of transitory food insecurity is the post harvest crop loss due to wildlife destruction or by other natural disasters.

In Bhutan, the unavailability of agricultural land or shortage of land is unavoidable. But proper utilization of land for improved agricultural production using hybrid seeds and improved agricultural technology has always been an option for the country especially in the western region where plenty of wetlands

are available. Despite this, the agricultural production of the country is declining. The predominant constraint in the field of lowered production is ascribed to the shortage of farm labour due to rural urban migration. On the other hand, rural to urban migration has accelerated the urban population's food demand that is not met by the decreasing food supply from rural farms. The pre harvest crop damage by natural hazards like wildlife attack, hailstorm, monsoon wind, floods and landslides are also causing shortage of food supply both at household and national level. With an increase in the population size, Bhutan is now foreseeing crisis in the size of the landholdings. In the coming future, many poor households may not own adequate land to meet their basic needs or to maintain a significant number of livestock.

To worsen the food security situation in Bhutan, access to food issues complements and supplements the food grain availability at household level. Households running out of assets do not have anything to fall back on particularly during the periods of crisis. In Bhutan, constraints such as access to roads, transport facilities, and other essential social and economic services like electricity, schools etc. was found to be contributing to the food insecurity situation to a greater extent. These amenities create income and employment opportunities, and ultimately enhance the food security status of the household. One of the reasons for the eastern geogs to turn out as most vulnerable is that these geogs were lacking in most of these essential services. The respondents from the eastern geogs also confirmed that the dry lands in this part of the country are not extensively used for commercial production of crops because the farmers do not have access to markets since the road and transport facilities are quite basic. Ownership of monetary livestock is considered an important asset in Bhutan as they can be bartered against food during transitory food insecurity. Pasturelands are compulsory for commercial production of livestock and livestock products. In eastern districts like Trashigang, Pemagatshel, Samdrup Jongkhar and in western district Samste households cannot rear enough livestock as these areas lack sufficient amount of pasturelands. During the food shortage periods, the food insecure households here have barely anything to depend on to fight the crisis.

The food utilization pattern in Bhutan is getting dominated by an increasing consumption of rice. The farm households eat three to four meals a day with rice dominating the food basket. For the eastern areas, maize substitutes the rice. It is believed that in rural Bhutan, 78 percent of the calorie intake is derived from cereals[23]. Availability of protein, the most expensive nutrient depends on access

[23] WFP Bhutan Country Paper, 2000, p.21

to dairy and poultry products. The results of the KBS workshops showed that in a majority of the geogs under Pemagatshal, Mongar, Zhemgang and Trashiyangste less than 40 percent of the people eat meat and other livestock products. The nutritional surveys that have been carried out in the country also show that children under five in these areas suffer from acute malnutrition.

In Bhutan, food insecurity is still confined to the rural areas. Creation of employment opportunities in rural areas for the growing population is constrained by many factors. These include the lack of rural roads, communication facilities, and electricity in many parts of the country. To stop the rural to urban migration, adequate opportunities need to be introduced in rural life to make it more attractive. Increasing the quantity and quality of basic amenities in rural life can probably lead to an alleviation of the existing food security for which long term planning and vision is required.

5.2 Recommendations

A major recommendation is that the results of this study can be used for better targeting and prioritization of the activities, both for the WFP Country Office in Bhutan as well as the Ministry of Agriculture and other government agencies involved in poverty alleviation and rural development. It is hoped that this report will constitute one of the bases for such policy decisions. In the words of the WFP Country Director, “WFP intends to use this report as a guide and apply it using common sense”. That implies that in the context of the education sector, one of the beneficiaries of WFP, this study will need to be adapted to suit the requirement of the Department. The heterogeneity of food security situation, which varies within a geog has to be taken into account, in spite of the uniform food vulnerability indicated by the VAM map. Further, the locality of boarder students should be checked as local students are not boarded.

Emerging phenomena is becoming evident -- aging, the feminization of the farming sector, and the labour force which is contributing to vulnerability of food insecurity. With these occurrences, it is also recommended that education policy and curriculum support their changes so that the youth have a better understanding and inclination towards returning to the rural and agriculture sector. All agencies should support and reinforce the various existing policy measures being taken by the education department in this regard.

5.2 Recommendations on improving the food security situation of geogs:

The recommendations that were forwarded by different geogs on improving the food insecurity situations are as follows:

5.2.1 Improvement in agricultural extension delivery system

Support to farmers in terms of irrigation facilities, pest control, crop diversification, land management, introduction of high yield variety crop and improved livestock breed, and modern farming technology were given highest preference among the recommendations. All these recommendations lead to the concept of best utilization of the small land holdings for maximum production or higher production from better breed livestock.

At least 8.9 percent of the country's total geogs or 18 geogs falling within the most vulnerable category strongly recommended the improvement of the extension delivery system (See *Table 11).*

5.2.2 Development of rural infrastructures particularly roads

This recommendation was reiterated by 9.4 percent of the geogs. At least 19 of the geogs falling under the most vulnerable group emphasized improvement of accessibility and road communication as a necessary step towards food security (*See Table 11).*

5.2.3 Pests management

Since crop damage by pest attack is one of the major concerns for the farmers, dissemination of modern technologies on pest management to farmers was proposed by the affected geogs. At least 62.5 percent, 40 percent and 42 percent of the geogs in Zhemgang, Sarpang and Pema Gathsel respectively expressed the urgent need for a pest management programme. Altogether 17 percent of the country's total geogs felt that some steps have to be taken at national level to control the crop damage by pests, partly wild boars and deer. *See Table 11*.

Table 11: List of geogs recommending improvement on agricultural extension delivery system, road access and pests management.

Agricultural extension delivery system		**Road access**		**Pests management**	
Dzongkhag	**Gewog**	**Dzongkhag**	**Geog**	**Dzongkhag**	**Gewog**
Samtse	Biru	Chhukha	Getana	Samtse	Biru
Samtse	Namgaye Chholing	Chhukha	Metap	Tsirang	Patale
Gasa	Laya	Chhukha	Logchina	Trongsa	Korphu
Wangdue	Kazhi	Samtse	Denchhukha	Zhemgang	Bjoka
Wangdue	Gangte	Samtse	Dungtoe	Zhemgang	Ngangla
Wangdue	Athang	Samtse	Namgaye Chholing	Zhemgang	Phangkhar
Wangdue	Daga	Gasa	Laya	Zhemgang	Shingkhar
Wangdue	Dangchhu	Wangdue	Athang	Zhemgang	Goshing
Dagana	Dorona	Zhemgang	Bardo	Sarpang	Doban
Trongsa	Korphu	Sarpang	Deorali	Sarpang	Hiley
Zhemgang	Bardo	Sarpang	Nichula	Sarpang	Senge
Sarpang	Doban	Lhuentse	Metsho	Sarpang	Umling
Sarpang	Senge	Mongar	Kengkhar	Sarpang	Deorali
Sarpang	Umling	Mongar	Silambi	Sarpang	Nichula
Trashigang	Thrimshing	Mongar	Gongdue	Pemagatshel	Chongshing
Pemagatshel	Chongshing	Mongar	Jurmey	Pemagatshel	Dungme
Pemagatshel	Dungme	Trashigang	Thrimshing	Pemagatshel	Chhimung
Pemagatshel	Chhimung	Pemagatshel	Dungme		
		Pemagatshel	Chhimung		

Besides the above mentioned specific recommendations, there were some general recommendations that were put forward by many of the geogs, that would lead to reduced food insecurity.

5.2.4 Creation of employment opportunities in the rural areas

Creation of employment opportunities in the non-farm sectors in the rural areas were considered the main option to reduce the rural urban migration and prevent labour shortage.

5.2.5 Opening up more branches of FCB

Opening up FCB branches in most of the dzongkhags enable the people to purchase food at subsidized rates during the lean periods.

5.2.6 Compensation for damaged crops and livestock

The compensation for crops damaged by wildlife and livestock lost to predators would help farmers minimize the intensity of food insecurity to some extent.

5.2.7 Riverbank protection, land stabilization

Protection of riverbanks was felt necessary to save the crops from river flooding. This recommendation was put forward particularly by the geogs whose cultivatable land were situated along the course of rivers.

5.2.8 Storage facility

An inadequate food grain storage facility is one of the important factors of food insecurity particularly in eastern Bhutan. Storage facilities need to be introduced both at commercial and household levels to boost food security.

References

Statistical Year Book of Bhutan 2004, National Statistical Bureau

Bhutan National Human Development Report 2000, Planning Commission, RGoB

A Situation Analysis of Children and Women in Bhutan, 2000, Thimphu. *(Cited in UNICEF Bhutan),*

Ninth Plan Main Document (2002-2007), Planning Commission, Royal Government of Bhutan

RNR Statistics 1999 (unpublished), 2000, 2002 and 2003, MoA, RGoB

Statistical Year Book of Bhutan 2002, 2003, CSO

Agronomic Survey by CSO 1990 & 1992;

Post Enumeration Survey by CSO; 1994;

Ura Karma, A Brief on Food Security, June 2005 *(an unpublished article submitted to WFP)*

Dept. of Revenue and Customs, 2003

BAFRA Agricultural Progress Report, 2002-2003 & 2003-2004

RGoB…, Nat Statistical Bureau???Bhutan Living Standard Survey, 2003

RGoB, NSB???…Poverty Analysis Report 2004,

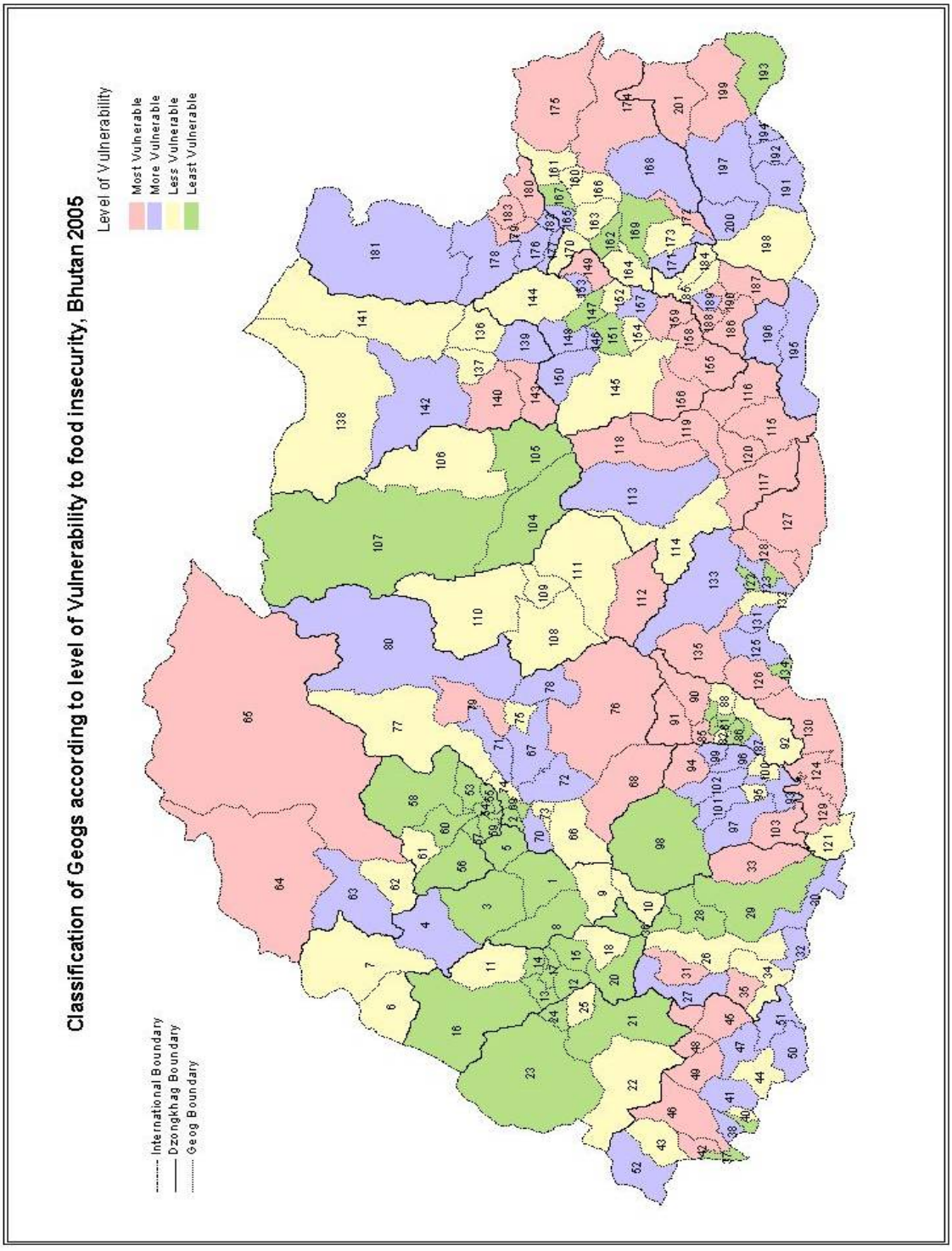
Current Human Development Outcomes in Bhutan, World Bank, May 31, 2005

Food Security and Vulnerability Profile-2000, Nepal

Documentation for Joint Sector Review Mission, 2004-RWSS Component under HSPS III, Department of Public Health, RGoB

Vulnerability Analysis and Mapping – 2000, Orissa, India

Annex 1: Map on level of vulnerability of geogs to food insecurity



Annex 2: Names of Geogs in Bhutan

SN	THIMPHU	SN	SAMTSE	SN	TSIRANG	SN	SARPANG	SN	TRASHIGANG
1	Chang	44	Samtse	87	Barshong	129	Deorali	173	Lumang
2	Bapisa	45	Denchhukha	88	Dunglagang	130	Senge	174	Merak
3	Kawang	46	Namgaye Chholing	89	Semjong	131	Bhur	175	Sakteng
4	Naro	47	Dorokha	90	Phuentenchhu	132	Gelephu	SN	YANGTSE
5	Toepisa	48	Mayona	91	Patale	133	Jigmechoeling	176	Tongmijangsa
6	Soe	49	Dungtoe	92	Beteni	134	Shompangkha	177	Jamkhar
7	Lingzhi	50	Pagli	SN	DAGANA	135	Doban	178	Yangtse
8	Mewang	51	Tading	93	Tsendagang	SN	LHUENTSE	179	Khamdang
9	Genye	52	Bangra	94	Lajab	136	Minjay	180	Yalang
10	Dagala	SN	PUNAKHA	95	Gozhing	137	Menbi	181	Bumdeling
SN	PARO	53	Shengana	96	Drukgyalgang	138	Kurtoe	182	Ramjar
11	Doteng	54	Dzoma	97	Gaserling	139	Tsenkhar	183	Toetsho
12	Lungnyi	55	Lingmukha	98	Tseza	140	Metsho	SN	PEMA GATSHEL
13	Lamgong	56	Kabjisa	99	Tsangkha	141	Khoma	184	Zobel
14	Dopshari	57	Guma	100	Trashiding	142	Gangzur	185	Shumer
15	Shapa	58	Toewang	101	Kana	143	Jaray	186	Dungme
16	Tsento	59	Talo	102	Khipisa	SN	MONGAR	187	Khar
17	Wangchang	60	Chhubu	103	Dorona	144	Ngatshang	188	Chhimung
18	Doga	61	Goenshari	SN	BUMTHANG	145	Saleng	189	Yurung
19	Hungrel		GASA	104	Chhume	146	Chali	190	Chongshing
20	Naja	62	Goenkhame	105	Ura	147	Sherigmuhung	SN	S / JONGKHAR
SN	HA	63	Goenkhatoe	106	Tang	148	Tsakaling	191	Phuntshothang
21	Sama	64	Laya	107	Chhoekhor	149	Balam	192	Pemethang
22	Sangbay	65	Lunana	SN	TRONGSA	150	Tsamang	193	Langchenphu
23	Bji	SN	WANGDUE	108	Tangsibji	151	Mongar	194	Samrang
24	Katsho	66	Gase Tshogom	109	Dragteng	152	Chaskhar	195	Norbugang
25	Uesu	67	Bjena	110	Nubi	153	Drametse	196	Dechhenling
SN	CHHUKHA	68	Daga	111	Langthil	154	Drepung	197	Martshala
26	Geling	69	Thedtsho	112	Korphu	155	Gongdue	198	Orong
27	Dungna	70	Nahi	SN	ZHEMGANG	156	Silambi	199	Serthig
28	Bjachho	71	Nyisho	113	Nangkor	157	Thangrong	200	Gomdar
29	Bongo	72	Ruepisa	114	Trong	158	Jurmey	201	Shingkhar Lauri
30	Dala	73	Gase Tshowom	115	Ngangla	159	Kengkhar		
31	Metap	74	Phangyuel	116	Bjoka	SN	TRASHIGANG		
32	Bhalujhora	75	Gangte	117	Phangkhar	160	Radi		
33	Getana	76	Athang	118	Shingkhar	161	Phongme		
34	Phuentsholing	77	Kazhi	119	Bardo	162	Kanglung		
35	Logchina	78	Phobji	120	Goshing	163	Samkhar		
36	Chapcha	79	Dangchhu	SN	SARPANG	164	Udzorong		
SN	SAMTSE	80	Sephu	121	Lhamoy zingkha	165	Bartsham		
37	Sipsu	SN	TSIRANG	122	Serzhong	166	Shongphu		
38	Chargharay	81	Kikhorthang	123	Chhuzargang	167	Bidung		
39	Yoeseltse	82	Tsholingkhar	124	Nichula	168	Kangpara		
40	Ugyentse	83	Mendregang	125	Dekiling	169	Khaling		
41	Chengmari	84	Gosaling	126	Hiley	170	Yangnyer		
42	Biru	85	Tsirangtoe	127	Umling	171	Nanong		
43	Tendruk	86	Rangthangling	128	Taklai	172	Thrimshing		

Annex 3: The Knowledge based Score Sheet

Questionnaire: I
ASSESSMENT OF VULNERABILITY OF GEOGS ACCORDING LEVEL OF FOOD INSECURITY
Policy and Planning Division, MoA / WFP, Bhutan

Please provide the information requested below for geogs in your dzongkhag based on best of your and other collogues' knowledge

Dzongkhag: ……. Geog: …….

INDICATOR		**SCORE**
Availability of food	1. Cereal production as a percentage of requirement/demand of the	
	2. Percentage paddy area under irrigation	
	3. Availability of meat	
	4. Availability of livestock products (milk, butter, cheese, eggs etc.)	
	5. Extreme weather shocks (landslides, droughts, floods etc)	
Access to food	6. Transport facilities	
	7. Percentage households with debts burdens	
	8. Percentage of households having access to safe (Pipe) drinking water	
	9. Health facilities (hospitals, BHUs, ORCs etc.)	
	10. Percentage of households using convenient cooking fuels (LPG gas or	
	11. Percentage of households with permanent roofing (like CGI sheets)	
	12. Percentage of households with permanent wall materials (Bricks, Cement blocks)	
	13. Percentage of households with permanent floor materials (Cement,	
	Please record appropriate numbers	**No.**
	14. Total number of Govt. schools	
	15. Number of …HSS ☐ MSS ☐ LSS ☐ PS ☐ CPS ☐	
	16. Number of Non-Formal Education Centers	
Utilization of food	**Please record appropriate percentages**	**%**
	17. Percentage of children in the age group of 3 – 5 years not attending	
	18. Percentage of eligible (5 - 15 years) children not attending schools	
	19. Percentage of children having frequent illnesses such as cold, fever	
	20. Percentage of households receiving all three principal meals	
	21. Percentage of malnourished children under 5 years	
	22. Percentage of pregnant women suffering with iron deficiency	
	23. Percentage of people suffering with Tuber culosis (TB)	

Prepared by:
Name: ……. Designation: ……. Signature: ……..Date: …
Reviewed by:
Name: ……..Designation: ……Signature: …… Date……

Questionnaire: II
ASSESSMENT OF VULNERABILITY OF GEOGS ACCORDING TO LEVEL OF FOOD INSECURITY
Policy and Planning Division, MoA / WFP, Bhutan

Pleases provide the information requested below for geogs in your dzongkhag based on best of yours and other collogues knowledge

Dzongkhag: ……. Geog: …….

HAZARDS	
a. What hazards does the community face? (landslides, drought, flood, pests, etc.). If there are two or more hazards, write the one that have most affect on food insecurity?	
b. Are these hazards becoming more or less frequent over time? Explain.	
c. Are these hazards becoming more or less severe over time? Explain.	
SOCIAL DYNAMICS d. Which group (children/men/women /pregnant mothers.) within the geog are most vulnerable to food insecurity and why?	
PROBLEM ANALYSIS e. Is food insecurity becoming more or less of a problem over time? If so, in what ways is it changing and why?	
f. What are the immediate underlying causes of food insecurity?	
g. According to your understanding, what are the three most important indicators that could be used to assess degree of vulnerability to food insecurity?	1. 2. 3.
INTERVENTION OPPORTUNITIES h. What are the interventions that could be implemented to reduce vulnerability of the geog to food insecurity? Describe what type of interventions that could be implemented with food assistance.	
i. Have the households of the geog received food aids before?	
j. What are the programs as a part of which food was delivered? (relief program, school feeding, ….)	
k. On the average, what is the level of vulnerability of geog? (Most, More, Less, Least)	

GUIDELINES ON ASSIGNING SCORES

Vulnerability Analysis and Mapping Unit, PPD, MoA / WFP, Bhutan

(Based on the best of your knowledge with respect to geogs under your dzongkhag, please assign scores).

A. Using the below given labels and scores assign appropriate scores for indicators 1, 2, 7, 8, 10.11.12 & 13.

1. Less than 20%
2. 21% - 40%
3. 41% - 60%
4. 61% - 80%
5. 81% - 100%

B. Using the below given labels and scores assign appropriate scores for indicators 3 & 4

1. *Very low level*
2. *Low level*
3. *Average*
4. *High level*
5. *Very high level*

C. Using the below given labels and scores assign appropriate scores for Indicator 5.

1. *1.Very frequent*
2. *2frequent*
3. *No shocks*
4. *rare*
5. *Very rare*

D. Using the below given labels and scores assign appropriate scores for Indicator 6.

1. *Very unsatisfactory and no regular and systematic transport services*
2. *……..*
3. *……..*
4. *……..*
5. *Very satisfactory and there is regular public and/or private transport services*

E. Using the below given labels and scores assign appropriate scores for Indicator 9.

1. *Very unsatisfactory and on an average, residents have to travel over 10 km or more to get health services*
2. ----------
3. ----------
4. ----------
5. *Very satisfactory and on an average, health services are available to the residents within a distance of 1km or less*

F. Scoring for indicators 14, 15 and 16: Please report in actual numbers.

G. Scoring for indicators 17 to 23: Please record the appropriate percentages for all indicators 17 to 23.

Annex 4: The Factors extracted through Principal Component Analysis

Annex 4: Table 1. Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.612	21.246	21.246	3.612	21.246	21.246	2.356	13.860	13.860
2	2.559	15.050	36.296	2.559	15.050	36.296	2.264	13.320	27.181
3	1.630	9.586	45.882	1.630	9.586	45.882	2.209	12.993	40.174
4	1.554	9.140	55.022	1.554	9.140	55.022	1.894	11.144	51.318
5	1.023	6.016	61.038	1.023	6.016	61.038	1.652	9.720	61.038
6	.978	5.750	66.788						
7	.892	5.248	72.036						
8	.768	4.516	76.552						
9	.753	4.428	80.980						
10	.569	3.349	84.329						
11	.540	3.174	87.503						
12	.494	2.905	90.408						
13	.435	2.557	92.965						
14	.397	2.335	95.300						
15	.361	2.121	97.421						
16	.305	1.795	99.216						
17	.133	.784	100.000						

Extraction Method: Principal Component Analysis.

Annex 4: Table 2. Rotated Component Matrix

	Component				
	1	**2**	**3**	**4**	**5**
Cultivable land area per household				.827	
% of households owning wet lands			.637	-.204	
% of household owning dry lands		-.711	-.233		
% of households growing apples and oranges					.861
Average number of monetary livestock unit per household		.595	-.330	.563	-.221
% of households with electricity	.587		.381	-.246	
Average crop production monetary value per households					.798
Average livestock production monetary value per household		.459	-.335	.630	
Average slope		.244	.700		
Availability of livestock products (milk, cheese, eggs et.)		.750			
Extreme weather shocks		.270	.316	.452	
Transport facilities	.457		.573		
% of household having access to safe/piped drinking water	.712				
Health facilities	.617				
% of households with permanent roofing material (like CGI sheet)	.526	.206	.392	-.287	
Total no. of govt. primary to high school in the geog	.607	-.321	-.290		
% of eligible children (5-15 years age) not attending school	.382	-.495	.424	.290	.281

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 10 iterations.

Annex 5: List of Geogs according to levels of vulnerability to food insecurity

Sl	Dzongkhag	Geog	Index	Rank
76	Wangdue	Athang	-1.32	Most
158	Mongar	Jurmey	-1.06	Most
68	Wangdue	Daga	-0.97	Most
159	Mongar	Kengkhar	-0.91	Most
103	Dagana	Dorona	-0.86	Most
42	Samtse	Biru	-0.8	Most
199	SamdrupJongkhar	Serthig	-0.78	Most
155	Mongar	Gongdue	-0.77	Most
156	Mongar	Silambi	-0.7	Most
90	Tsirang	Phuentenchhu	-0.69	Most
35	Chhukha	Logchina	-0.68	Most
188	Pemagatshel	Chhimung	-0.68	Most
124	Sarpang	Nichula	-0.66	Most
190	Pemagatshel	Chongshing	-0.65	Most
46	Samtse	Namgaye Chholing	-0.59	Most
135	Sarpang	Doban	-0.59	Most
79	Wangdue	Dangchhu	-0.58	Most
48	Samtse	Mayona	-0.56	Most
65	Gasa	Lunana	-0.55	Most
129	Sarpang	Deorali	-0.55	Most
201	SamdrupJongkhar	Shingkhar Lauri	-0.55	Most
116	Zhemgang	Bjoka	-0.54	Most
120	Zhemgang	Goshing	-0.53	Most
186	Pemagatshel	Dungme	-0.53	Most
118	Zhemgang	Shingkhar	-0.52	Most
143	Lhuentse	Jaray	-0.52	Most
130	Sarpang	Senge	-0.5	Most
31	Chhukha	Metap	-0.49	Most
126	Sarpang	Hiley	-0.49	Most
140	Lhuentse	Metsho	-0.48	Most
179	Yangtse	Khamdang	-0.46	Most
45	Samtse	Denchhukha	-0.45	Most
112	Trongsa	Korphu	-0.45	Most
127	Sarpang	Umling	-0.45	Most
128	Sarpang	Taklai	-0.45	Most
94	Dagana	Lajab	-0.44	Most
33	Chhukha	Getana	-0.43	Most
119	Zhemgang	Bardo	-0.43	Most

Sl	Dzongkhag	Geog	Index	Rank
175	Trashigang	Sakteng	-0.43	Most
180	Yangtse	Yalang	-0.42	Most
85	Tsirang	Tsirangtoe	-0.41	Most
49	Samtse	Dungtoe	-0.39	Most
187	Pemagatshel	Khar	-0.38	Most
64	Gasa	Laya	-0.37	Most
91	Tsirang	Patale	-0.37	Most
149	Mongar	Balam	-0.37	Most
172	Trashigang	Thrimshing	-0.37	Most
115	Zhemgang	Ngangla	-0.35	Most
117	Zhemgang	Phangkhar	-0.34	Most
174	Trashigang	Merak	-0.33	Most
183	Yangtse	Toetsho	-0.33	Most
52	Samtse	Bangra	-0.32	More
97	Dagana	Gaserling	-0.32	More
153	Mongar	Drametse	-0.32	More
181	Yangtse	Bumdeling	-0.32	More
4	Thimphu	Naro	-0.31	More
148	Mongar	Tsakaling	-0.31	More
157	Mongar	Thangrong	-0.31	More
27	Chhukha	Dungna	-0.29	More
102	Dagana	Khipisa	-0.29	More
200	SamdrupJongkhar	Gomdar	-0.29	More
142	Lhuentse	Gangzur	-0.28	More
196	SamdrupJongkhar	Dechhenling	-0.28	More
47	Samtse	Dorokha	-0.27	More
99	Dagana	Tsangkha	-0.26	More
150	Mongar	Tsamang	-0.24	More
30	Chhukha	Dala	-0.23	More
71	Wangdue	Nyisho	-0.23	More
146	Mongar	Chali	-0.23	More
80	Wangdue	Sephu	-0.22	More
125	Sarpang	Dekiling	-0.22	More
123	Sarpang	Chhuzargang	-0.22	More
70	Wangdue	Nahi	-0.21	More
178	Yangtse	Yangtse	-0.2	More
195	SamdrupJongkhar	Norbugang	-0.2	More
191	SamdrupJongkhar	Phuntshothang	-0.2	More
133	Sarpang	Jigmechoeling	-0.19	More
72	Wangdue	Ruepisa	-0.18	More
139	Lhuentse	Tsenkhar	-0.18	More

Sl	Dzongkhag	Geog	Index	Rank
171	Trashigang	Nanong	-0.16	More
32	Chhukha	Bhalujhora	-0.15	More
78	Wangdue	Phobji	-0.15	More
96	Dagana	Drukgyalgang	-0.13	More
197	SamdrupJongkhar	Martshala	-0.13	More
168	Trashigang	Kangpara	-0.11	More
51	Samtse	Tading	-0.1	More
177	Yangtse	Jamkhar	-0.1	More
182	Yangtse	Ramjar	-0.1	More
189	Pemagatshel	Yurung	-0.1	More
63	Gasa	Goenkhatoe	-0.09	More
192	SamdrupJongkhar	Pemethang	-0.09	More
194	SamdrupJongkhar	Samrang	-0.09	More
38	Samtse	Chargharay	-0.08	More
113	Zhemgang	Nangkor	-0.08	More
87	Tsirang	Barshong	-0.07	More
41	Samtse	Chengmari	-0.06	More
131	Sarpang	Bhur	-0.05	More
176	Yangtse	Tongmijangsa	-0.05	More
93	Dagana	Tsendagang	-0.04	More
165	Trashigang	Bartsham	-0.04	More
50	Samtse	Pagli	-0.03	More
67	Wangdue	Bjena	-0.03	More
101	Dagana	Kana	-0.03	More
184	Pemagatshel	Zobel	-0.02	Less
108	Trongsa	Tangsibji	-0.01	Less
152	Mongar	Chaskhar	0	Less
170	Trashigang	Yangnyer	0	Less
173	Trashigang	Lumang	0.01	Less
43	Samtse	Tendruk	0.04	Less
34	Chhukha	Phuentsholing	0.05	Less
111	Trongsa	Langthil	0.08	Less
144	Mongar	Sherimuhung	0.08	Less
137	Lhuentse	Menbi	0.09	Less
154	Mongar	Drepung	0.09	Less
9	Thimphu	Genye	0.1	Less
88	Tsirang	Dunglagang	0.1	Less
110	Trongsa	Nubi	0.1	Less
77	Wangdue	Kazhi	0.11	Less
100	Dagana	Trashiding	0.12	Less
44	Samtse	Samtse	0.13	Less

Sl	Dzongkhag	Geog	Index	Rank
92	Tsirang	Beteni	0.14	Less
95	Dagana	Gozhing	0.14	Less
145	Mongar	Saleng	0.14	Less
164	Trashigang	Udzorong	0.14	Less
185	Pemagatshel	Shumer	0.14	Less
25	Ha	Uesu	0.15	Less
82	Tsirang	Tsholingkhar	0.18	Less
121	Sarpang	Lhamoy zingkha	0.18	Less
62	Gasa	Goenkhame	0.19	Less
132	Sarpang	Gelephu	0.19	Less
26	Chhukha	Geling	0.2	Less
73	Wangdue	Gase Tshogom	0.2	Less
22	Ha	Sangbay	0.21	Less
136	Lhuentse	Minjay	0.21	Less
11	Paro	Doteng	0.22	Less
40	Samtse	Ugyentse	0.22	Less
166	Trashigang	Shongphu	0.22	Less
10	Thimphu	Dagala	0.23	Less
75	Wangdue	Gangte	0.23	Less
114	Zhemgang	Trong	0.23	Less
66	Wangdue	Gase Tshowom	0.24	Less
161	Trashigang	Phongme	0.24	Less
6	Thimphu	Soe	0.25	Less
61	Punakha	Goenshari	0.25	Less
106	Bumthang	Tang	0.25	Less
163	Trashigang	Samkhar	0.25	Less
138	Lhuentse	Kurtoe	0.26	Less
7	Thimphu	Lingzhi	0.27	Less
74	Wangdue	Phangyuel	0.27	Less
18	Paro	Doga	0.28	Less
109	Trongsa	Dragteng	0.3	Less
160	Trashigang	Radi	0.31	Less
141	Lhuentse	Khoma	0.32	Less
198	SamdrupJongkhar	Orong	0.32	Less
60	Punakha	Chhubu	0.35	Least
193	SamdrupJongkhar	Langchenphu	0.35	Least
83	Tsirang	Mendregang	0.37	Least
86	Tsirang	Rangthangling	0.37	Least
167	Trashigang	Bidung	0.37	Least
29	Chhukha	Bongo	0.38	Least
169	Trashigang	Khaling	0.4	Least

Sl	Dzongkhag	Geog	Index	Rank
16	Paro	Tsento	0.42	Least
20	Paro	Naja	0.42	Least
134	Sarpang	Shompangkha	0.42	Least
81	Tsirang	Kikhorthang	0.43	Least
162	Trashigang	Kanglung	0.43	Least
15	Paro	Shapa	0.44	Least
39	Samtse	Yoeseltse	0.44	Least
37	Samtse	Sipsu	0.48	Least
98	Dagana	Tseza	0.48	Least
36	Chhukha	Chapcha	0.51	Least
122	Sarpang	Serzhong	0.51	Least
19	Paro	Hungrel	0.55	Least
89	Tsirang	Semjong	0.55	Least
105	Bumthang	Ura	0.55	Least
147	Mongar	Ngatshang	0.55	Least
13	Paro	Lamgong	0.56	Least
5	Thimphu	Toepisa	0.57	Least
151	Mongar	Mongar	0.57	Least
24	Ha	Katsho	0.59	Least
55	Punakha	Lingmukha	0.59	Least
59	Punakha	Talo	0.67	Least
8	Thimphu	Mewang	0.69	Least
58	Punakha	Toewang	0.69	Least
84	Tsirang	Gosaling	0.69	Least
12	Paro	Lungnyi	0.7	Least
56	Punakha	Kabjisa	0.7	Least
54	Punakha	Dzoma	0.71	Least
23	Ha	Bji	0.76	Least
21	Ha	Sama	0.76	Least
53	Punakha	Shengana	0.76	Least
2	Thimphu	Bapisa	0.77	Least
104	Bumthang	Chhume	0.81	Least
107	Bumthang	Chhoekhor	0.83	Least
14	Paro	Dopshari	0.85	Least
28	Chhukha	Bjachho	0.86	Least
17	Paro	Wangchang	0.88	Least
57	Punakha	Guma	0.91	Least
69	Wangdue	Thedtsho	0.91	Least
3	Thimphu	Kawang	1.15	Least
1	Thimphu	Chang	2.35	Least

Annex 6: Tables presenting the results from KBS questionnaire II

Annex 6: Table 1. Percentage of geogs responding to reasons of food insecurity for the vulnerable groups

Dzongkhags	No reason	Poor diet	Lack of knowledge	Other reasons	Total
Bumthang (n=4)	100				100
Chukha (n=11)	100				100
Dagana (n=11)	9	91			100
Gasa (n=4)		75		25	100
Ha (n=5)	40	60			100
Lhuentse (n=8)	100				100
Mongar (n=16)	100				100
Paro (n=10)	100				100
Pemagatshel (n=7)	100				100
Punakha (n=9)			100		100
SamdrupJong (n=11)	100				100
Samtse (n=16)	100				100
Sarpang (n=15)	14	79		7	100
Tashigang (n=16)	75	19		6	100
Thimphu (n=10)	100				100
Trashi Yang (n=8)	100				100
Trongsa (n=5)		100			100
Tsirang (n=12)	83	17			100
Wangdue (n=15)	13	87			100
Zhemgang (n=8)		100			100

Annex 6: Table 2. Percentage of geogs responding to changing nature of food insecurity

Dzongkhags	Deteriorating	Improving	Remains the same
Bumthang (n=4)			100
Chhukha (n=11)	27	27	45
Dagana (n=11)		100	
Gasa (n=4)	50	50	
Ha (n=5)	80	20	
Lhuentse (n=8)		25	75
Mongar (n=16)		31	69
Paro (n=10)			100
Pemagatshel (n=7)	43		57
Punakha (n=9)		100	0
Samdrup Jongkhar (n=11)	36	45	18
Samtse (n=16)	6	13	81
Sarpang (n=15)		93	7
Tashigang (n=16)	6	19	75
Thimphu (n=10)			100
Trashiyangtse (n=8)		13	88
Trongsa (n=5)	20	80	
Tsirang (n=12)		75	25
Wangdue (n=15)	67	7	27
Zhemgang (n=8)		100	

Annex 6: Table 3. Geog responses on factors/causes of food security (in %)

	Negative factors							Positive factors		
Dzongkhag	No response	Other	Cash crop declining	More population less production	Agricultural land taken away	Rural urban migration	Improved agriculture	Improved accessibility	Developmental impacts	Improved awareness and nutrition
Bumthang	99.00									
Chhukha	63.64	9.09	9.09	9.09	9.09					
Dagana									81.82	18.18
Gasa				50.00			25.00	25.00		
Ha		39.00			20.00	20.00	20.00			
Lhuentse	99.00									
Mongar	99.00									
Paro	99.00									
Pemagatshel	99.00									
Punakha	11.11						77.78			11.11
S / Jongkhar	81.82						9.09	9.09		
Samtse	87.50	6.25							6.25	
Sarpang	21.43						60.00	7.14		14.29
Trashigang	93.75						6.25			
Thimphu	100.00									
T / yangtse	99.00									
Trongsa							100.00			
Tsirang	24.00						16.67	8.33	50.00	
Wangdue	53.33	6.67		33.33			6.67			