CHAPTER I

(Statement of the problem, Importance of the study, Conceptual Framework, Objectives, Research Questions, Methodology etc.)

Introduction:

Food is one of the most important basic necessities of every individual. In the primitive community when man lived in jungles he did not have clothing or even shelter. But he needed food to survive. Animals live without clothing or shelter but also need food. Thus for all living beings food is the most essential component of life. Access to good quality food has been human being's incessant endeavour from the earliest days of existence. There is a proverb which is significant "We are what we eat". Our health and nutritional status, physical and mental abilities also depend on the food we eat and how we eat it. Good quality of food is needed by human being for their productivity as well as longitivity. So food production and food distribution have been key focus areas for a good number of policy makers.

Considering the importance of food for the improvement of capability as well as the existence of human being which indirectly signifies strong and prosperous world, ensuring sufficient and good quality of food for each and every human being is recognized globally from 1940s. Article 25(1) of Universal Declaration of Human Rights recognized that food security is a basic human right. Since then, the concept of food security has been defined differently by different scholars as well as policy makers. It is a flexible concept which is reflected by the development of different definitions in research and policy usage. Up to 90s of the last century almost 200 definitions of it are available in publications.(Maxwell and Smith,1992)

Statistics from the various sources of world economy recognized that a large section of population in underdeveloped or developing countries like India largely in backward states has limited access to food in terms of their entitlement or supply of food grains in the food deficit areas. It thus requires a strong public policy to proper distribution of essential items to the needy persons at their affordable price and fulfils their nutritional requirements. The Public Distribution System (PDS) is the flagship programme of India which provides essential commodities mainly the food items to

the people of India especially the poorest of the poor people to ascertain their food security. But the performance of PDS towards achieving the goal of food security of the Below Poverty Line (BPL) people is still under serious scrutiny.

I.1. Statement of the Problem:

Food security as a concept originated only in the mid 1970s in the discussions of international food problems which originated from global food crisis (Clay 2002). In 1970s many definitions of food security were concentrated on the concern towards building up of national or global level food stocks i.e. the importance of the physical availability of food stocks (Frankenberger and Maxwell,1992). The World Food Summit defines food security as "availability at all times of adequate world food supplies of basic food stuffs ----, to sustain expansion of food consumption---, and to offset fluctuations in production and prices" (UN 1975). This approach is a supply side approach.

Amartya Sen (1981) in his work "Poverty and famine: An Essay on Entitlement and Deprivation" has challenged the view of the World Summit. He argued that this is a case of people not having enough to eat but this is not necessary a result of there being enough food to go around. Food and Agricultural Organization (FAO) expanded the concept of food security by considering a third aspect i.e. securing access by vulnerable people to available supplies. It defines food security as " Ensuring all people at all times have both physical and economic access to the basic food that they have need" (FAO1983)

The World Bank's report on Poverty and Hunger (1986) redefines the concept of food security as "access of all people at all times to enough food for an active, healthy life". (1986) It introduced the widely accepted distinction between chronic food insecurity, associated with problems of continuing or structural poverty and low incomes and transitory food insecurity, which involved periods of intensified pressure caused by natural disasters, economic collapse or conflict. (Clay 2002)

The World Food Summit in its Plan of Action gives a comprehensive and more complex definition of food security. It defines " Food security at the individual, household, national, regional and global levels is achieved when all people, at all

times have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." (FAO 1996) This definition is again redefined in The State of Food Insecurity 2001 report of FAO. This definition states, " Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences of an active and healthy life." (FAO2002). This definition points out the multidimensional nature of food security concept which encompasses food availability, food access, food utilization and food stability. Food availability is a function of production whereas access to food is a function of purchasing power or employment and earnings. Utilization of food means the absorption of food into the body while the stability dimension highlights the fact that a population, household or individual must have access to adequate food at all times. (FAO 2006) This definition is the most widely accepted definition of food security till now.

Although different approaches have been made to ensure food security for every human being, still poverty, hunger and malnutrition are the common features in different countries, basically in the developing and underdeveloped countries of the world. The past half century has witnessed growth in food production. Nevertheless, more than one in seven people today still do not have access to sufficient protein and energy from diet and even more suffer from some form of micronutrient malnourishments. (Charles et.al 2010)

I.2. Food Security in India:

In India, food security as a national objective was placed on the policy agenda much earlier than in other developed and developing countries (Sinha, 2004). The 'grow more food' campaign of the pre-independence period and a food foundation sponsored report 'Indian Food Crisis and Steps to Meet It' in 1959 mark the beginning of India's concern over food security (Ghosh & Khasnobis,2006). The green revolution of 1960's was the foremost attempt to combat food security. By implementing new technology, with government support as well as training and extension paved the way to a more market oriented dynamic agriculture (Ghosh & Khasnobis,2006)

By the end of 1980s India achieved self-sufficiency in the food production in the national level and no longer remained a food shortage country through dramatic investments in technology, institutions and infrastructure (Babu, 2008). Now India is not only self-sufficient in grain production, but also has a substantial reserve. The progress made in agriculture during the last four decades has been one of the biggest success stories of independent India. Agriculture and allied activities constitute the single largest contributor to the gross domestic product (Sinha, 2004).

Since the Independence of India, Government of India followed the policy of providing food grains and other food consumption goods through the Public Distribution System (PDS). Initially it was provided with rationed amount, however with the changing time, changes have been brought in the system of providing food grain and other essential commodities to make the PDS more effective. Besides this National Advisory Council (NAC) of Government of India recently drafted the National Food Security Bill to make the poor entitled with the right to get an access to food as reasonably low price so that India becomes completely free from the starvation and poverty.

But despite these significant efforts and political commitment for ensuring food security of all the people of the Nation, India's food security scenario has remained precarious. India is the only Asian country other than Bangladesh and Yemen that are in the top 25 of 97 hunger affected countries in the world. The rest of the countries come from Africa (Babu 2008). According to FAO of the United Nations, 200 million people, one fourth of the world's undernourished population live in India. In India, almost 40 percent of children under three were underweight and 45 percent were stunted in 2007. 22 to 30 percent children are born with low birth weight. Another 36 percent adult women and 34 percent adult men suffer from chronic energy deficiency (Chronicle India 2011). Such type of severity of malnutrition can only be observed in famine prone countries.

Like the national scenario, the situation in Assam is almost similar. BPL Census 2002 exerts that the percentage of poverty in Assam is also very high. Even the food grain production of the state is not self-sufficient. Rice is the main crops of Assam. But the productivity of Rice in Assam is among the lowest compared with the other producing

states like Punjab, Haryana. Although different policies and programmes have been introduced both the Central as well as State Governments for ensuring food security, the situation is still not satisfactory in Assam. High Infant Mortality rate, Malnutrition etc. signify a gloomy picture of food security of Assam. Although the PDS system covers a huge population under its social safety nets, its performance is still to be questioned, specially the state of food security of the Below Poverty Line (BPL) families are still not satisfactory.

Golaghat District comprises of eight Developmental blocks. These are Golaghat North, Golaghat South, Golaghat east, Golaghat West, Golaghat Central, Gomariguri, Morongi and Kakodonga Development Block. As per the data provided by the NREGA website 73935 families are recognized as BPL families in 2011. Out of which Golaghat south Development Block has the highest numbers of BPL families and Golaghat North Development Block has the lowest numbers of BPL families which are 15525 and 2741 nos. respectively.

Recognizing the problem of achieving the food security of the people of Assam, particularly the BPL households, the present study would be endeavour to measure the state of food security of the people of Assam specially the BPL families and the role of PDS to ensure their food security.

I.3. Importance of the Study:

Good quality of food is the necessary pre condition of everybody's health, which ultimately determines the productivity as well as capability of the every human being. Food security is everybody's endeavour. In recent past, ensuring food security is one of the prime objectives of each and every countries of the world.

Food security is not just involved with production. Rather it involves every individual gaining physical, economic, social and environmental access to a balanced diet that includes the necessary macro and micro nutrients, safe drinking water, sanitation, environmental hygiene, primary health care, and education so as to lead a healthy and productive life (Chronicle, 2011). Although different approaches as well as policies are implemented globally to ensure food security for each individuals, till now food insecurity and hunger is a common feature in most of the countries. These problems

are very serious in the developing as well as underdeveloped countries. The Millennium Development Goals (MDGs) of United Nations also signifies the importance of food security. It advocates that food security has to ensure for every individuals by 2015's. These goals are agreed to by all the world's leading development institutions. So, almost every country of world is now unprecedentedly efforts to meet the needs of the world's poorest (Pandiyan 2010).

As like the other countries of the world, the government of India also constantly makes it effort to ensure food security of each individual. By these systematic efforts, India has achieved food self-sufficiency in 1980s through dramatic investments in technology, institutions and infrastructure. Yet India's effort in achieving food security for all Indians remains unimpressive. Over 200 million of India's population is under fed and millions are undernourished. About 41 percent of the world's underweight children are belongs to India. In India 47 percent of children less than 5 years old are underweight 45% are stunted and 16 percent have severe malnutrition (Babu 2008). As a fast developing country, and positioning itself to be one of the world's most powerful nation's, India, cannot afford to have such a vast number of food and malnourished people. Without individual food security, a basic entitlement, India cannot make any progress in other aspects of human development. The UN Human Development Index signifies it clearly.

Public Distribution System (PDS) is the flagship programme of the government of India to ensure food security to the individuals especially for the below Poverty Line (BPL) individuals. Further Government of India redefine the Universal PDS into Targeted Public Distribution System (TPDS) in the year 1997 to provide social safety nets to only the poor's. Although more than 10 crore BPL cards are distributed, till now poverty and hunger problems are not eliminated. Majority of needy poor individuals are still outside the purview of social safety nets.

Like the all India average as well as other states, the situation of Assam is also similar. Ensuring food security to all the individuals is still a distant dream in Assam. In this regard the role of PDS is also under serious scrutiny.

The BPL Census 2002 exerts that still 55.77 lakhs population of Assam are living below poverty line which is 22.30 percent of the total population of the state. This

shows a gloomy picture of the state of food security in Assam. Although some macro level studies are conducted to assess the food security in Assam as well as the performance of PDS to ensure food security, micro level studies are not taken into consideration. In assessing the state food security of the BPL families of Assam and assessing the role of PDS to ensure their food security, it is very much essential to conduct a micro level study on the state of food security of the BPL households.

I.4. Area of the Study- Golaghat District:

Golaghat is one of the important rural economy based districts of Upper Assam. It covers the total area of 3502 Sq. km. and is located 100 meters above the sea level. It lies between $93^{o}16'$ East to $94^{o}10'$ East longitude and between $25^{o}50'$ North to $26^{o}47'$ North Latitude. The district is bounded by Brahmaputra River on the North, Jorhat and Nagaland on the East, Karbi Anglong and Nagaland State on the South and Naogaon, Karbi Anglong on the West. As per the data of 2011 census, the total population of the district has been recorded as 1058674 of which male and female were 539949 and 518725 respectively. The literacy rate of the district were78.31 percent where male and female literacy rate were 84.20 and 72.18 percent respectively. Fig.I(1) shows the map of Golaghat district.

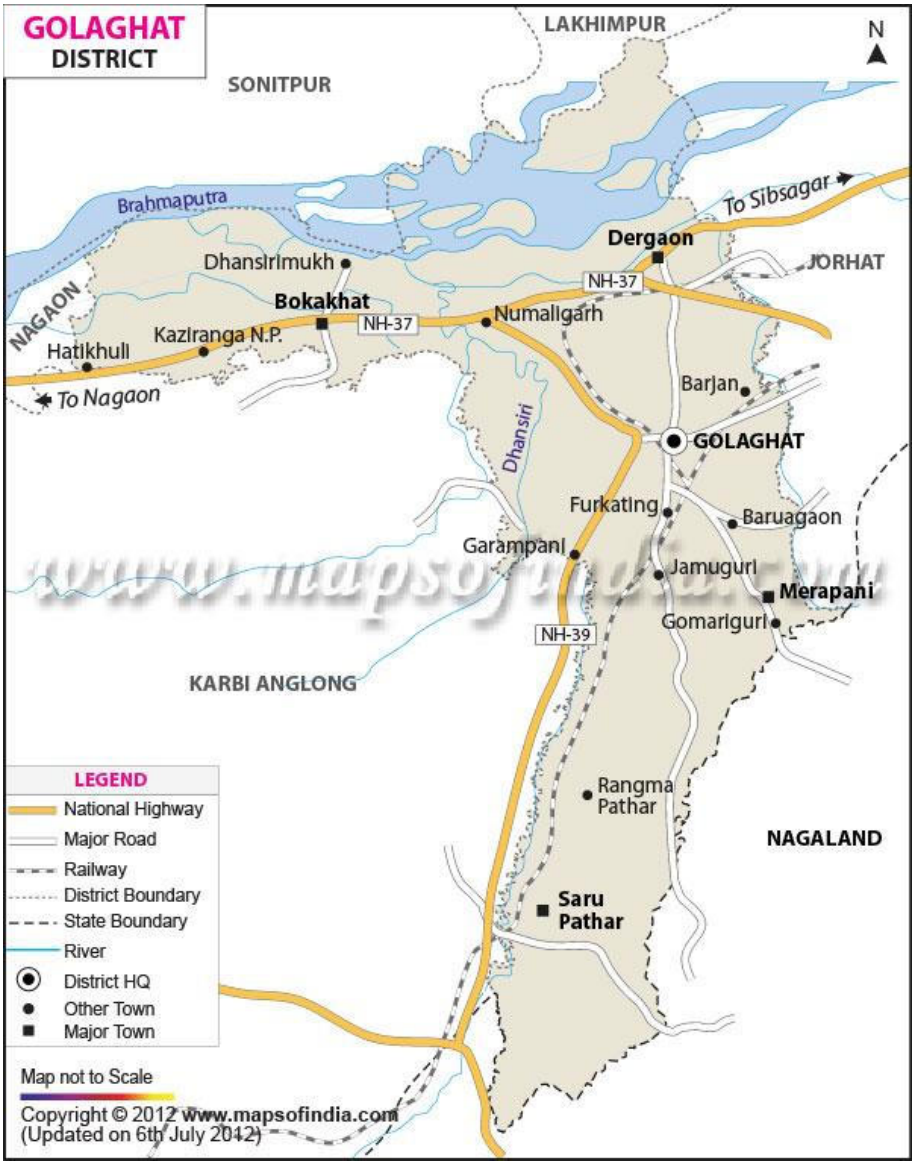


Fig.I (1): Map of the Golaghat District

I.5. Conceptual Framework of the Study:

The term food security as a concept originated in international development literature in the 1960's and 1970's at the time of global food crisis (Clay, 2002). Till then upto the 90's of the last century almost 200 definitions of it are available in the published writings (Maxwell and Smith 1992)

In the early 1980's however a paradigm shift occurred in the analysis of food security. Amartya Sen (1981) argued that food security is more of a demand concern than a supply concern i.e. affecting availability of food at the national level. Since then food

security is defined primarily a problem of access to food. At the same time the analysis also shifted from the global and national level to household and individual level. The most widely accepted definition of food security is ---

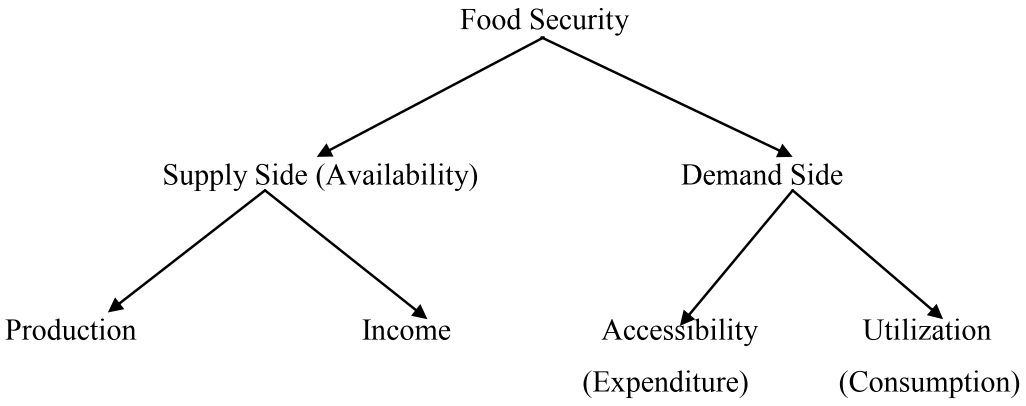
> "*Food security exists when all people at all times, have physical, social and economic access to the sufficient food which meets their dietary needs and food preferences for an active and healthy life" (FAO 2006)*

This definition points out four distinct but inter related elements of food security which are essential to achieve food security. These are – food availability, food accessibility, food utilization and food sustainability.

In the present study household food security has been measured by both supply side as well as demand side. In the supply side i.e. food availability has been calculated by considering the all sources of income as well as the production of food item by the household itself. In the demand side it has been calculated by determining the expenditure in the food item as well as non food item and has been also calculated by using the contribution of all food available to the households' per capita calorie intake by considering the 7 days recall method. The chart of conceptual framework has been depicted in the Fig. I(2) below-

Fig.I(2)

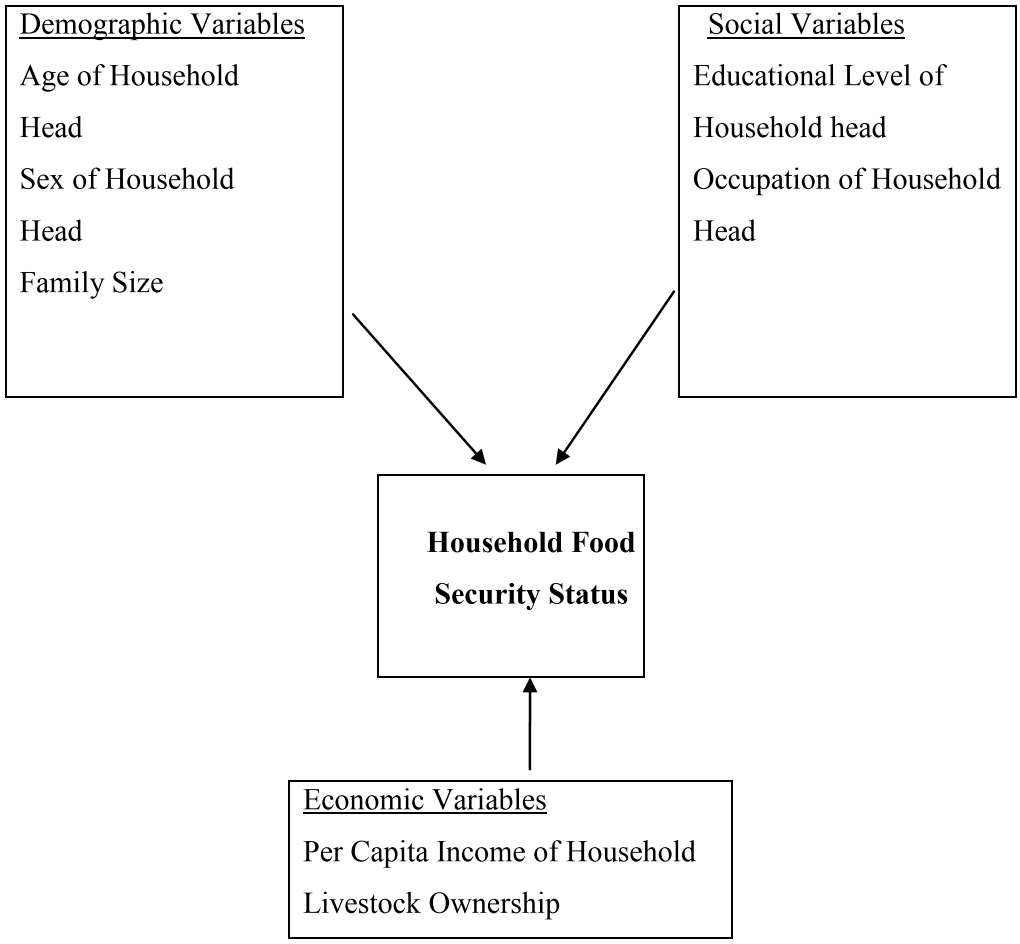
Conceptual Framework of Household Food Security Status



To identify the various potential socio economic and demographic variables which influence the household food security status in the present study eight variables has been selected. The chart of the conceptual framework has been given in the fig. I(3) below—

Figure No: I(3)

Conceptual Framework to Identify the Potential Variables which Influence Household Food Security Status



I.6. Objectives of the Study:

Keeping in view the importance of such studies, the present study frames the following objectives. The general objectives of this study is to evaluate the state of food security of the BPL households of Assam especially in Golaghat District and the role of PDS to ensure the food security of these BPL families. The specific objectives of the study are—

a) To assess the state of food security of the BPL families of the Golaghat District of Assam.

b) To compare the extent of food security of the BPL households with and without the BPL cards.

c) To identify the determinants of food security among the BPL households of the Golaghat District of Assam.

d) To assess the performance and role of PDS in providing assistance for household food security to the BPL families.

e) To suggest the strategy for policy measures both for the State as well as Central governments to improve the state of food security of each and every households of Assam in general and of the BPL households in particular

I.7. Research Questions:

In order to address the above mention objectives the present study has framed the following research questions:

a) What is the extent of food security of the BPL households with and without having the BPL cards?

b) What are the various factors which determine the food security status of the BPL households?

c) How much the PDS system ascertains the food security of the BPL families?

d) What policy measures can be suggested for the improvement in the state of food security status of the BPL households?

I.8. Methodology and Data Base:

As per the BPL Census 2002, there are 1683118 nos. of Below Poverty Line (BPL) households in Assam. Therefore it is quite difficult for an individual researcher to undertake an intensive study on the food security to all the BPL households of Assam. So keeping in mind the constraints of an individual researcher, the present study covers only one district of Assam, i.e. Golaghat District, selected purposively. There are altogether 27 districts in Assam, the rationale behind the selection of Golaghat district is due to higher concentration of rural people among the districts of Upper Assam. In Golaghat district 90.84 percent (as per 2011 census) people are rural

people, which is next to the Dhemaji district (with 92.96 percent) among the districts of Upper Assam. As per the Statistical Handbook of Assam, 2013 data in 2011- 2012 using Tendulkar methodology, 33.98 percent rural people of Assam are living below poverty line , whereas 20.49 percent of urban population of Assam are living below poverty line. So, considering high concentration of rural people in the district, the present study selects the Golaghat district purposefully. Besides this, no study on the food security status of BPL households in the Golaghat district has been done till now.. Golaghat district is one of the important rural economy based districts of Upper Assam. It is divided into 3 sub- divisions namely Golaghat, Dhansiri and Bokakhat sub- division. There are altogether eight development blocks viz. Morangi , Gamariguri, Kakodunga, Golaghat Central. Golaghat South, Golaghat North, Golaghat East and Golaghat West development block consist of 102 Gaon Panchayats and 2 Municipal Board and 3 Town Committee. As per the data of 2011 Census, the total population of the district has been recorded as 1066888 nos, of which male and female are 543161 and 523727 respectively. The literacy rates of the district were 77.43 percent where male and female literacy rate were 83.56 percent and 71.09 percent respectively.

As per the data provided by the www.pnrdassam.gov.in website of Government of India, in 2011, 73935 families are recognized as BPL families in Golaghat district of Assam. The target population of the present study has been the BPL households with or without having BPL cards. The multistage purposive and stratified random sampling technique has been used in the present study. The first stage of sampling starts with the selection of Golaghat district, selected purposively. In the next stage from all the 8 development blocks, 1 Gaon Panchayat has been selected randomly to collect samples from the rural BPL households. In addition to this to collect samples from the urban BPL households, one ward has been selected randomly each and every municipal board and town committees of the Golaghat district. In the final stage, the sample households were randomly drawn from the selected Gaon Panchayats and Town wards by using a random number table. The households which are having the BPL identification number are considered as BPL households and taken into consider to collection of samples.

For the sample size, altogether 500 BPL households are surveyed. As the rural urban composition of the Golaghat district is almost 90:10, here in the present study rural urban sample composition has been taken as 80:20 i.e. 400 sample BPL households are surveyed from the rural area of the Golaghat district and 100 sample BPL households are surveyed from the urban area of the Golaghat district.

From the Morangi development block, one Gaon panchayat i.e. Rangdoi Gaon panchayat has been selected randomly and surveyed 50 rural BPL households randomly. From the Gamariguri development block, one Gaon panchayat i.e. Gamari Adarsha Gaon panchayat has been selected randomly and surveyed 50 rural BPL households randomly. From the Kakodunga development block, one Gaon panchayat i.e. Uttar Pachim Kakodunga Gaon panchayat has been selected randomly and surveyed 50 rural BPL households randomly. From the Golaghat Central development block also one Gaon panchayat i.e. Kachupathar Gaon panchayat has been selected randomly and surveyed 50 rural BPL households randomly. From the Golaghat South development block one Gaon panchayat i.e. Tengahulla Gaon Panchayat has been selected randomly and surveyed 50 rural BPL households randomly. From the Golaghat North development one Gaon panchayat i.e. Michamara Gaon panchayat has been selected randomly and surveyed 50 rural BPL households randomly. From the Golaghat East development block one Gaon panchayat i.e. Athgaon Gaon panchayat has been selected randomly and surveyed 50 rural BPL households randomly. Similarly from the Golaghat West development one Gaon panchayat i.e. Uttar Muhura Gaon panchayat has been selected randomly and surveyed 50 rural BPL households randomly.

As mentioned earlier, there are all total 5 towns (2 Municipal Board and 3 Town Committee) in the Golaghat district viz. Golaghat Town, Dergaon Town, Sarupathar Town, Barpathar Town and Bokakhat town. Under which Sarupathar and Barpathar Town are under Golaghat South development block, Golaghat town is under Golaghat East development block, Dergaon town is under Golaghat North development block and Bokakhat town is under Golaghat West development block. From the Golaghat town, one town ward i.e. ward no 6 has been selected randomly and surveyed 20 urban BPL households randomly. From the Dergaon town, one town ward i.e. ward no 4 has been selected randomly and surveyed 20 urban BPL households randomly.

From the Bokakhat town one town ward i.e. ward no 3 has been selected randomly and surveyed 20 urban BPL households randomly. From the Sarupathar town one ward i.e. ward no 2 has been selected randomly and surveyed 20 urban BPL households randomly and similarly from the Barpathar town war i.e. ward no 1 has been selected randomly and surveyed 20 urban BPL households randomly.

The selection of rural BPL households from the eight development blocks has been explained below with the help of the chart in figure no. I(4)

The procedure of selecting the sample urban BPL households from the Golaghat district are shown in figure no. I(5) with the help of the chart

As a whole 500 sample BPL households are surveyed for the study out of which 400 are surveyed for the study, out of which 400 households are rural BPL households and 100 are urban BPL households. The whole structure of sample design of the study has been presented graphically in figure no. I(6) with the help of a flow chart

Primary data has been collected from the FPS dealer also apart from all the selected Gaon panchayats and town wards. From all the selected 8 Gaon panchayats, 2 FPS dealer are selected for the survey from whom the sample rural BPL households brought PDS goods. Likewise for all the selected 5 town wards 1 FPS dealer is selected for the survey from whom the sample urban BPL households brought PDS goods. All total 21 FPS dealer (16 rural, 5 urban) has been selected for primary data to collect information regarding PDS.

Fig. No. I (4): Sample design of rural BPL households

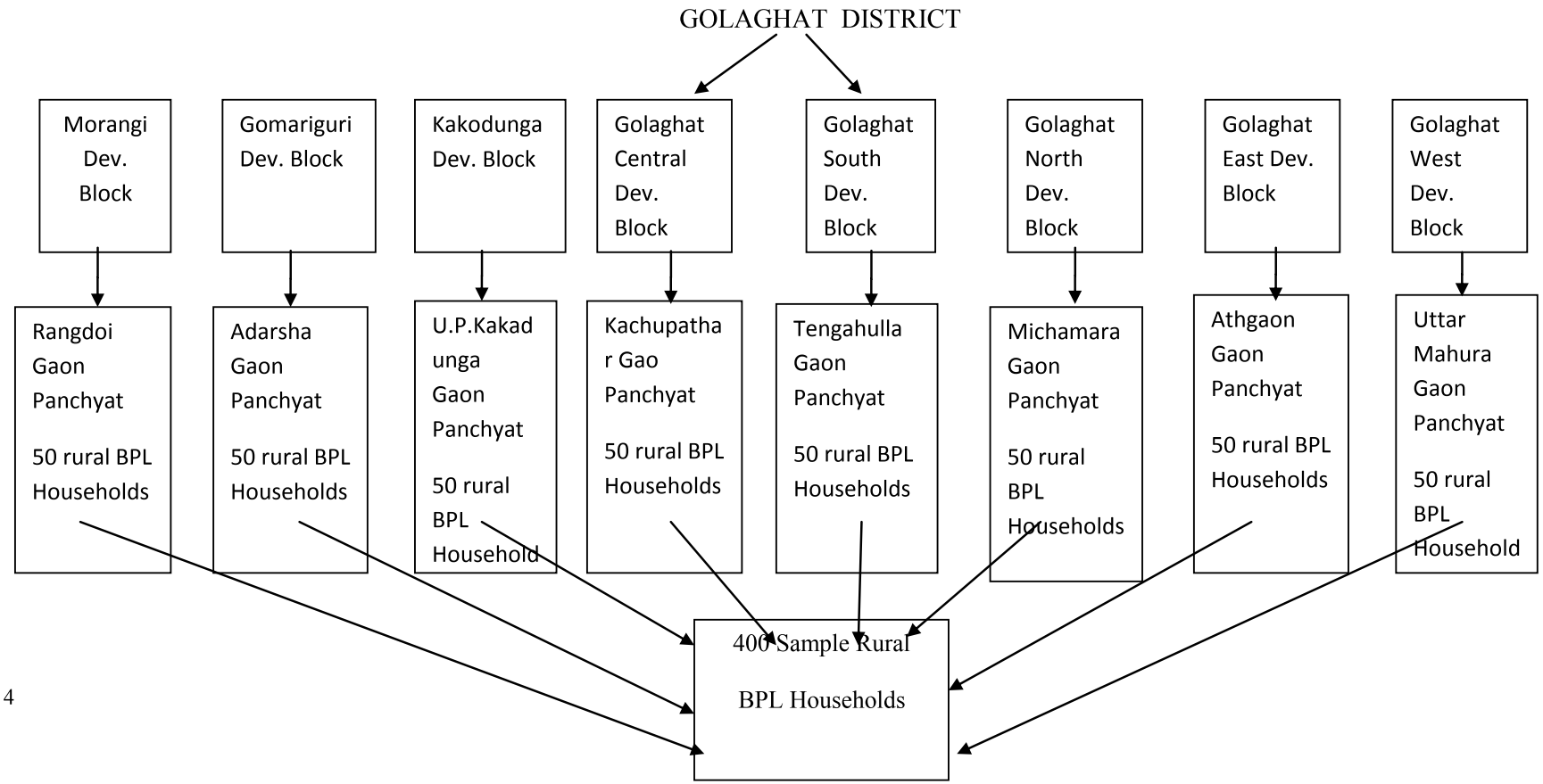


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Figure No- I(5)

Sample design of urban BPL households

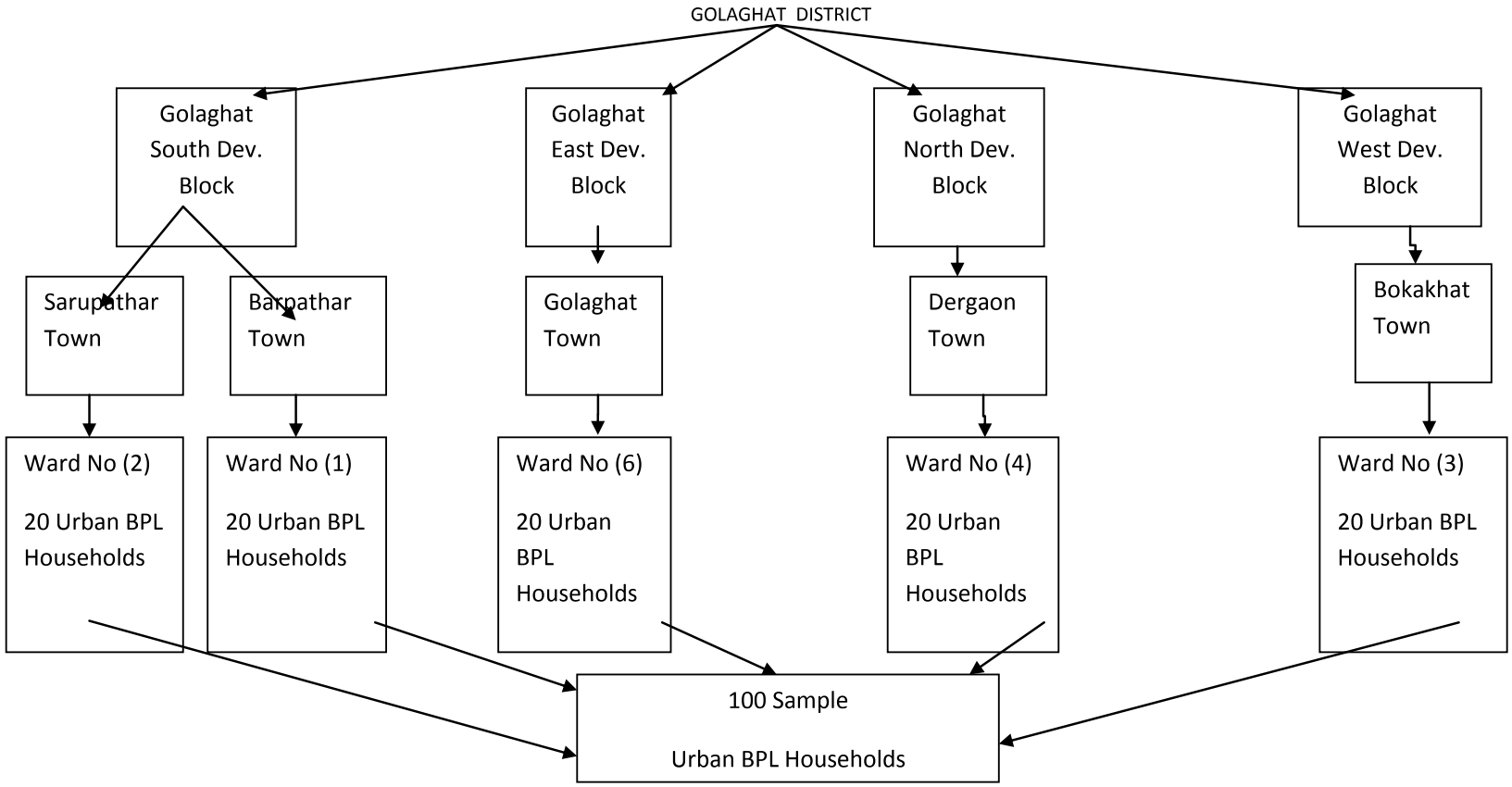
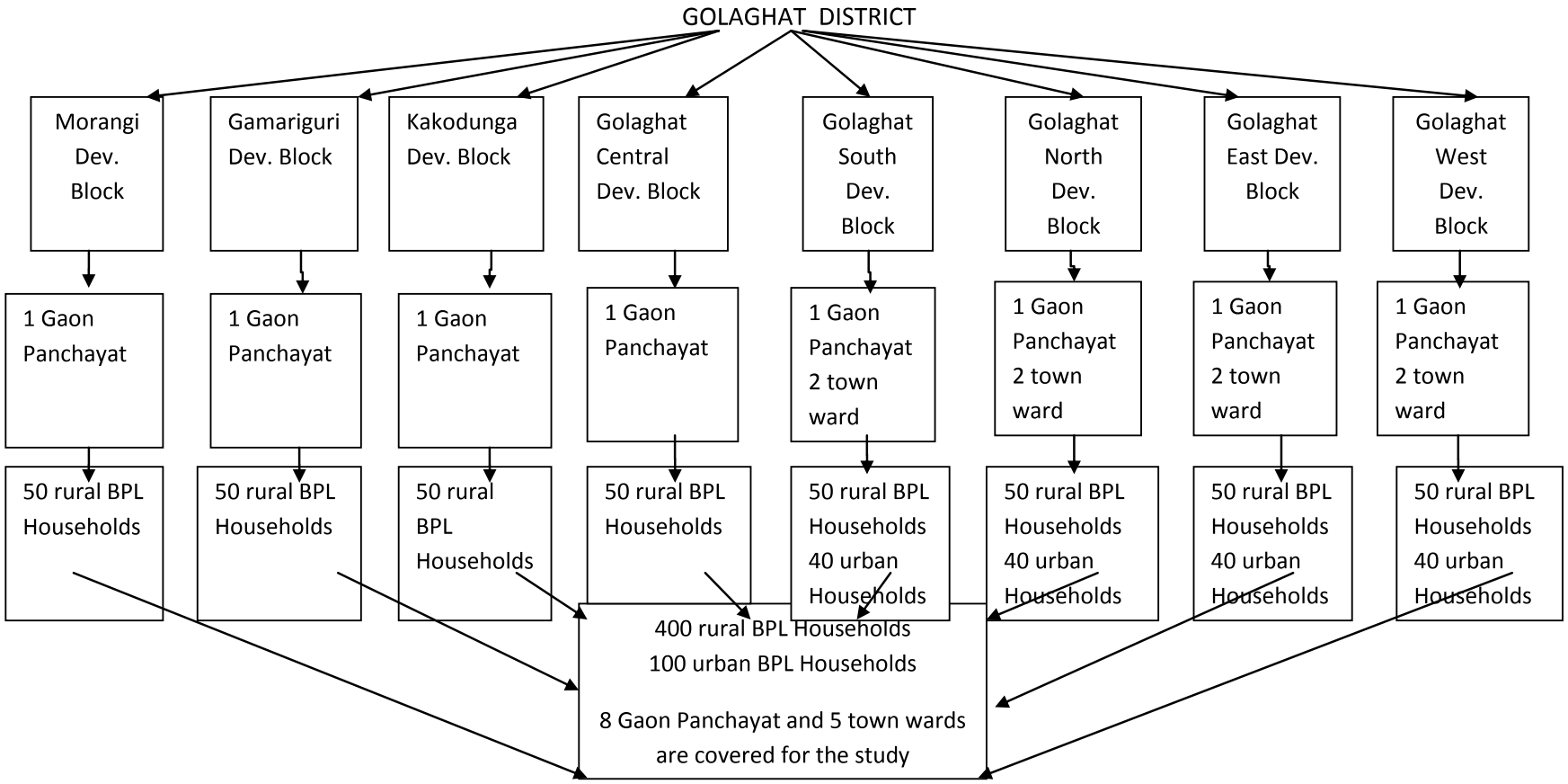


Figure No- I(6)

Sample Design for the Study



I.8.(A) Data Base:

For the purpose of the study both primary data and secondary data are used. Primary data are collected from the selected sample rural as well as urban BPL households of the Golaghat district and also from the FPS dealer of the concerning surveyed area. The survey was conducted between the months June to December 2014. For collecting the primary data on the state of food security of the sample, BPL households which are cross sectional in nature, a pre tested interview schedule has been designed the interview schedule was framed up by using some key indicators which would help in revealing the real food security status of the BPL households as well as role of PDS on their food security status.

To supplement the primary data, secondary data has been collected from various government departments, number of books, journals, thesis, articles as well as various internet sites, published data issued local, natural and international organisation. Some of the important secondary data series are-

1) Census Report of India, 2011
2) BPL Census 2002
3) Report of the Department of Food and Civil Suppliers and Consumer Affairs, Government of Assam
4) Report of the District Food and Civil Suppliers and Consumer Affairs Department, Golaghat district of Assam
5) Report of the Planning Commission of India – 2011
6) Statistical Handbook of Assam- 2011
7) Statistical Handbook of Assam – 2013
8) Economic Survey of Assam – 2010-2011
9) Economic Survey of Assam – 2013-2014

I.8.(B) Data Analysis:

In order to achieve the set objectives, techniques such as frequency distribution, various indices, regression analysis, descriptive statistics like mean, standard deviation, inferential statistics like 'Z' test, chi-square test are incorporated. In order to achieve the objective of measuring the status of household food security, food security index, shortfall index i.e. food insecurity gap, squared food insecurity gap, surplus index, head count ratio are constructed by following the Ometesho et.al (2006), Guja (2012) and Shumiye (2007). In addition to that the severity level of food insecurity has been determined by following Guja (2012).In addition to these food security of the sample household has been estimated by Household Dietary Diversity Score (HDDS) also. To compare the food security status of BPL households with and without having the BPL cards, frequency distribution, ratio, percentage, inferential statistics like Chi-square test, 't' test has been used. To identify the significant socio economic as well as demographic factors which influence the food security status of the sample BPL households a Binary Logistic Regression model is applied. In addition to that a simple regression model is also applied to incorporate the magnitude of food insecurity of the sample households. To access the role of PDS in providing assistance, for the food security status of BPL households, descriptive statistics like, percentage, ratio, as well as inferential statistics 'Z' test has been used. In addition to that a Simple Regression model is also applied to identify the significant role of PDS on the food security status of sample BPL households. The results are estimate by using the data analysis and statistical software, SPSS 17 and STATA 11

I.8.(B) (i) Food Security Status:

To measure the household food security of sample population, a food security index has been constructed using the index constructed by Ometesho et.al (2006). To construct these food security index four steps has been followed. In the first step net consumed food grains by the sample households was converted into equivalent total Kilocalories using conversion factors (Annexure I). Secondly from the available kilo calories, the per capita per day kilo calories are determined by adult adjustment conversion factor (Annexure II). Thirdly following (FAO 1993, WFP 2006) the present study has been used the widely accepted minimum requirement of 2400 kcal

adult adjustment per capita per day in rural area and 2100 kcal adult adjustment per capita per day in urban area as bench mark for defining food security line. At last a ratio between per capita calories available and per capita calories requirement by a household was used to determine the food security status of a household. A household whose the food security index was greater than or equal to 1 was regarded as food secure while a household whose food security index was less than 1 was regarded as food insecure. The food security index is given by –

Food Security Index (Z)= Household Daily Per capita calorie availability (A)

Households Daily Per capita Calorie Requirement (I)

While collecting information regarding consumption of food seven day recall method has been used and daily household calorie consumption has been estimated by dividing the estimated total calorie consumption of household during the week by 7. Daily per capita calorie consumption has been estimated by dividing the estimated daily consumption by the household size.

I.8.(B)(ii) Head Count Ratio:

The Head count ratio has been also determined in the present study expressed as

H = m/n

Where m = number of food insecure households and n= total number of households in the sample. The head count ratio was calculated to measure the extent of undernourishment.

I.8.(B)(iii) Food Insecurity Gap:

In the present study to measure the extent of food insecurity, food insecurity gap (also known as shortfall index) total food insecurity gap and squared food insecurity gap has been estimated by following Guja (2012)

Food Insecurity Gap (FIG_i) of the ith food insecure households is defined as

$$FIG_i = \frac{(TCR_i - TCC_i)}{TCR_i}$$

Where TCR_i= Total per capita calorie requirement for the ith food insecure household

TCC_i = Total per capita calorie consumption by the ith food insecure household

Total Food Insecurity Gap (TFIG) , which indicates the depth of food insecurity among the food insecure households is expressed as---

$$TFIG_i = \sum_{i=i}^{m} FIG_i/m$$

Where m= total number of food insecure household

Squared Food Insecurity Gap (SFIG), which indicates severity of food insecurity among the food insecure household is measured by

$$SFIG = \sum_{i=i}^{m} (FIG_i^2/m)$$

I.8.(B)(iv) Surplus Index:

To measure the extent of food security of the food secure household, surplus index is constructed in the present study, which is defined as—

$$SURPLUS\ INDEX = \sum_{i=i}^{m} FSG_i/m$$

Where

$$FSG_i = \frac{(TCC_i - TCR_i)}{TCR_i}$$

TCC_i = Total per capita calorie consumption of the ith food insecure household.

TCR_i = Total per capita calorie requirement of the ith food secure household.

m= Total number of food secure household.

I.8.(B)(v) Severity Level of Food Insecurity:

To analyse the severity level of food insecurity in the present study the calorie intake shortfalls were estimated based on nutritional reference level. (2400 kcals/day/adult for rural people and 2100/kcals/day/adult for urban people) The calorie consumption

estimates has been used to directly categorize the degree of food insecurity as follows based on the study of Guja (2012)—

Table No : I(1)

Level of Food Security

Food Security Status	Calorie Consumption Per Person, Per Day
Food Secure	Above 2400 kcals for rural households Above 2100 kcals for urban households
Marginally Food Insecure	Between 1800 kcals to 2400 kcals for rural households Between 1800 kcals to 2100 kcals for urban households
Moderately Food Insecure	Between 1500 kcals to 1800 kcals
Severely Food Insecure	Below 1500 kcals

Source: Guja (2012)

I.8.(B)(vi) Food Security Status Based on Household Dietary Diversity Score (HDDS):

Household Dietary Diversity Score (HDDS) is a simple sum of score of the number of food items consumed by members of a household over a recall period. The recall period usually ranges from one day to one week. To calculate HDDS, first of all, the numbers of different food items that are usually consumed are calculated. The food groups should reflect a quality diet, that is, the groups should contain all the nutritionally required elements. As per the guideline of Food and Nutritional Technical Assistance Project (FANTA), 12 food items are considered to calculate the HDDS. By following the consumer expenditure survey of National Sample Survey Organization (NSSO) of India, the present study however have been classified the food items into 8 major groups as (i) Cereals (ii) pulses (iii) vegetables and fruits (iv) milk and milk products (v) egg/meat/fish (vi) root and tubers (vii) fats and oil seeds (viii) miscellaneous

After selecting the food groups data has been collected by asking the respondents series of ‘yes’ or ‘no’ type questions. Thus the respondents are asked whether a particular group of food is consumed or not within a stipulated recall period. Here

score 1 has been given for each positive response and 0 has been given for each negative response. The questions refer to the households as a whole, not any single number of the household.

The HDDS score variable has been computed for each household by summing up all the responses. Households which have the HDDS value greater or equal to 4 classified as 'food secure' household. The other group households have been termed as 'food insecure' with less than 4 HDDS score.

I.8.(B) (vii)Comparison between the Food Security Status of BPL Households with or Without BPL Cards:

To compare the food security status of sample BPL households with or without having BPL cards, descriptive statistics are used to compare food security, food insecurity status, food surplus index, food shortfall index and squared food insecurity gap. In addition to that the severity level of food insecurity has been also compared between the BPL households with or without having BPL cards.

Independent Samples 't' Test:

To test whether there is significant difference in the per capita calorie consumption between the households having the BPL card and not having the BPL card an independent samples 't' test has been drawn.

I.8.(B)(viii) Determinants of Food Security:

To find out the various socio economic and demographic variables which significantly influence the food security status of sample BPL households, descriptive statistics like mean, standard deviation, percentage as well as inferential statistics such as 'Z' test and Chi-square test has been used. A binary logistic regression model has been drawn to identify the various socio economic and demographic variables which influence the food security status of sample BPL households taking food security as dependent variable whose have dichotomous value if '1' is assigned if the household is food secure and value of '0' is assigned if the household is food insecure. Based on economic theories, various empirical works and type of qualitative data collected during the survey, eight explanatory variables, which are expected to have significant

impacts in determining the food security status of the BPL household has been taken as independent variable. The cumulative logistic probability function is specified econometrically by following Tsegaye and Wageyehu (2010) as—

$$P_i = F(Y_i) = F[ß_0 + \sum_{i=1}^{n} ß_i X_i]$$

$$= [1/\ 1+e^{-(ß_o+\Sigma ß_i X_i)}] \quad \text{---------- (1)}$$

Where P_i= represents that the probability that ith household is being food secure given X_i

X_i= represents the ith explanatory variable

Y_i= a linear function of n explanatory variables (X_i)

e = represents the base of natural logarithms (2.718)

$ß_0$ and $ß_i$ are regression parameters which are estimated in the model, where $ß_0$ is the intercept and $ß_1, ß_2$…….. $ß_n$ are slope coefficients of the equation

To understand the interpretation of the coefficients the logistic model has been written in terms of the odds and log of odds. The odd ratio is the probability that a household would be food secured (P_i) to the probability that it will be food insecure ($1-P_i$) . (Gujarati , 1998) The probability that household is food insecure ($1-P_i$) is defined by--

$$(1-P_i) = 1/\ 1+e^{Y_i} \text{---------- (2)}$$

And putting using natural logarithm

$$Y_i = Ln\ [\ P_i/\ 1-P_i] = ß_0 + ß_1X_1 + ß_2X_2 + \ldots\ldots + ß_nX_n \text{---------- (3)}$$

By introducing disturbance term in the model, the logit becomes ---

$$Y_i = ß_0 + ß_1X_1 + ß_2X_2 + \ldots\ldots + ß_nX_n + U_i$$

Or

$$Y_i = ß_0 + \sum_{i=1}^{n} ß_i X_i + U_i$$

The independent variables have been checked for the existence of multicollinearity. The Variance Inflation factor (VIF) and Condition Index (CI) has been chosen to

handle the collinearity problem among and/or between continuous variable. For dummy variables multicollinearity problem has been checked using contingency coefficient calculated from chi-square by following Gujarati (2003).

Simple Regression Model:

In order to incorporate the magnitude of food insecurity of the sample households a simple regression model has been fitted, taking per capita calorie intake as the dependent variable and the entire explanatory variable taken in the binary logistic regression model as independent variable. The model is given by ---

$$Y_i = ß_0 + \sum_{i=1}^{n} ß_i X_i + U_i \text{---------- (4)}$$

Where Y_i = Per capita calorie intake of ith household

X_i = represents ith explanatory variable where (i= 1,2, …….. n)

$ß_0$ = is the intercept

$ß_i$ = slope coefficients in the model

U_i= Stochastic Error Term

I.8.(B)(ix) Role of PDS on Providing Assistance on Food Security:

To achieve the objective of accessing the role of PDS towards providing assistance on food security of the sample BPL households, descriptive statistics like percentage, ratio, gap between requirement and allotment of PDS items, mean, standard deviation etc. has been analysed. In addition to that a paired 'Z' test has been drawn to test whether there is significant difference of PDS contribution to the household food security status.

Simple Regression Model:

In order to test the role of PDS towards providing assistance for the food security status of the BPL household, a simple regression model has been drawn, by taking household per capita calorie intake as the dependent variable and percentage contribution of PDS in per capita calorie intake as a continuous variable. The regression model is given by

$$Y = ß_0 + ß_1 X_1 + U_1$$

Where Y= Level of food security

X_1= Percentage contribution of PDS on per capita calorie intake

U_1= Stochastic Error Term

I.9. Chapter Scheme of the Study:

The present study has been organized into seven chapters. These are done as follows:

(i) **Chapter One:(Introduction)** The first chapter deals with the background of the study and the statement of the problem. This chapter also outline the objectives, research questions, analytical tools and data description.

(ii) **Chapter Two (Review of the Literature):** In order to address the research questions and to identify the research gaps of the study an extensive review of existing literature (both theoretical and empirical) has been carried out and placed in the second chapter.

(iii) **Chapter Three (Public Distribution System in India):** A detailed account of the evolution of Public Distribution System in India and the functioning of the same in the country as well as in the state is presented in the third chapter as it is the main social safety nets for the food security of the BPL families.

(iv) **Chapter Four (Socio Economic and Demographic Profile of the Sample Household):** The fourth chapter has been briefly explained the socio economic and demographic profile of the people of Golaghat District in general and of the surveyed population in particular.

(v) **Chapter Five (Food Security Status of the Sample BPL Households):** The fifth chapter has been analysed the state of food security of the surveyed population. This chapter also analysed the various determinants of household food security status of the sample population. A comparison of the status of food security between the sample BPL households with and without having the BPL card has been also visualised in this chapter.

(vi) **Chapter Six (Role of PDS on Household food Security):** The sixth chapter explained the performance of the PDS in the study area as well as its role towards the state of food security of the BPL families of the surveyed district.

(vii) **Chapter Seven (Summary of the Findings, Policy Recommendation and Concluding Remarks):** All the major findings of the study has been summarized in the last chapter and gave some policy suggestions to all the constituents like the Food and Civil Suppliers and Consumer affairs Department, State Government as well as Central Government and most importantly for the BPL households to ensuring food security throughout the year.

I.10. Limitation of the study:

The study is not free from limitations. It suffers from inherent limitations of sampling procedure. Findings may vary if it is undertaken at different cross sections of population of the state as well as the studied district also. Here the level of household food security has been analysed mainly on the basis of adult equivalent per capita calorie intake of the households with its comparison with certain recommended level which may vary at different time periods. In addition to these the researcher also feels the inadequacy of taking subjective information from the respondents in assessing their food security status as a large number of respondents are illiterate and unable to provide all the information accurately. Beside, intra household issues of food security also have not been addressed here. Still, it is hoped the study will be helpful to provide some statistics as well as policy prescriptions for improving the food and nutritional security of the region in general and of the BPL households in particular.