Chapter 4

Food Security in Assam

In this chapter we present the analysis of food security in Assam. The analysis is made based on both secondary and primary data. First section deals with the food security analysis based on secondary data. Based on the secondary data a food security index is constructed in this section for the years 2001 and 2011. As the analysis of secondary data does not reflect the food security status at the micro level (at the household level) so we have resorted to a field survey. Based on the data from field survey we have constructed a household based food security index focusing on all four dimensions of food security. In the next section we deal with the food security analysis based on primary data across agro-climatic zones in Assam at the household level. The last section deals with some of the dynamisms around the concept of food security.

4.1 The Study Area

In this section we have enunciated about the study area. The elaborations include perspectives both from secondary and primary data.

4.1.1 **Profile of Study Area**

We now present below a very brief profile of the study area, the state of Assam.

(a) Population

According to the Census of India, 2011 the population of Assam stands at 3,11,69,272, of which 1,59,54,927 are males and 1,52,14,345 females. The decadal growth of the State's population works out to 16.93 percent during the decade 2001-2011 as against 17.64 percent for the country as a whole. The density of population of the State has gone up to 397 as against India's density 382 as per 2011 Census. The corresponding State's figure as per 2001 Census was 340 (Table 4.1).

Table: 4.1
Population Features of Assam at a Glance: 2001 and 2011 Census

Particulars	Unit	2001	2011
Population	Lakh	267	311
Decadal Growth	Percent	18.92	16.93
Density	Per Sq. Km.	340	397
Sex-Ratio	Females per 1000 males	935	954
Literacy	Percent	63.25	73.18
(a) Male	Percent	71.28	78.81
(b) Female	Percent	54.61	67.27
Urban Population	Percent	12.90	14.08
(a) Male	Percent	53.41	51.61
(b) Female	Percent	46.58	48.39
Rural Population	Percent	87.10	85.92
(a) Male	Percent	51.43	51.12
(b) Female	Percent	48.57	48.88
S.C. Population	Percent	7.40	NA
S.T. Population	Percent	12.83	NA

Source: Census of India 2011.

(b)Population by Economic Activity

Classification of population by economic activity according to the result of Population Census, 2001 reveals that out of total population of 26655528 in the State, 9538591 were total workers of which 7114097 were main workers and 2424494 were marginal workers. Among male workers 85 percent were main workers, 15 percent were marginal workers, while among females 47 percent were main workers and 53 percent were marginal workers. Out of the total 9538591 workers in Assam, 3730773 were Cultivators (39 percent), 1263532 were Agricultural labourers (13 percent), 344912 were engaged in Household Industries (4 percent) and 4199374 were Other Workers (44 percent). Thus, about 52 percent working population was engaged in Agriculture (i.e. cultivators and agricultural labourers) in the State (Table 4.2).

Table: 4.2
Distribution of Workers and Non Workers in Assam: 2011 Census

Workers	Person	Male	Female
Total workers	9538591	6870960	2667631
Main workers	7114097	5849032	1265065
Marginal workers	2424494	1021928	1402566
Cultivators	3730773	2634068	1096705
Agricultural labourers	1263532	832508	431024
Household Industries workers	344912	133902	211010
Other workers	4199374	3270482	928892
Non workers	17116937	6906077	10210860

Source: Population Census, 2011

(c) Rural and Urban Population

As per Population Census, 2011, the rural population of the State was 86 percent of the total population. This percentage was much higher than that for All-India (69 percent). The proportion of rural population in the State decreased from 87 percent in 2001 to 86 percent in 2011. As per the Population Census, 2011, around 14 percent of the State population was living in urban areas. The proportion of urban population in the State increased from 12.9 percent in 2001 to 14 percent in 2011.

(d)Sex Ratio

The sex-ratio in the State shows an improvement from 935 in 2001 to 954 in 2011. The sex ratio in the age-group 0-6 years is the vital indicator of the future trends of the sex composition in the population in the State. Child sex ratio in the State was 957 female per 1000 male child as per Census, 2011. The corresponding sex ratio in the State for the age-group 0-6 years declined to 967 in 2001 from 975 in 1991.

(e)Literacy

The growth of literacy in Assam has shown an encouraging sign. The literacy rate for Assam as per Census 2011 increased to 73 percent with 79 percent for males and 67 percent for females. The literacy rates for rural and urban areas found at 70.44

percent and 88.88 percent respectively. The literacy rate for country as a whole increased to 74 percent from 65 percent with male and female literate 79 percent and 67 percent respectively.

(f) State Domestic Product

The economy of the State in terms of Gross State Domestic Product (GSDP) at factor cost is expected to grow at the rate of 8.42 percent in real terms (at 2004-05 prices) as per Advance Estimates for 2011-12 as against the growth rate of 7.34 percent estimated in the previous year. The Gross State Domestic Product (GSDP) at constant (2004-05) prices for the year 2013-14(Advance Estimates) is estimated at ₹86,86,172 crores as against ₹8079864 crores for 2012-13 (Quick Estimates) reflecting a growth of 7.50 percent. The estimated growth of 7.50 percent in GSDP of the State for 2011-12 comprises of a growth of 4.36 percent in Agriculture and Allied sector, 7.19 percent in Industry sector and 9.74 percent in Services sector. The Net State Domestic Product (NSDP), also known as State Income, at 2004-05 prices has also grown by 9.21 percent for the year 2013-14.

(g)Agriculture

The economy of Assam continues to be predominantly agrarian. The Agriculture sector in the State providing employment to more than 50 percent of the rural people The net cultivated area of the State is 28.11 lakh hectare(2009-10) which is about 88 percent of the total land available for agricultural cultivation in the State. The contribution of Agriculture sector to the State Domestic Product was nearly 25 percent during 2010-11.

(h)Land Utilization

As per the Land Utilization Statistics for the year 2009-10(Provisional), the total reporting area (Village paper) of the State was 78.50 lakh hectares. Out of the total reporting area, net sown area constitute 35.80 percent [28.10 lakh hectares], 23.61 percent was under forest, land not available for cultivation 26.26 lakh hectares or 33.45 percent of the total reporting area and other uncultivable area was 4.32 lakh hectares or 5.5 percent. While Fallow land constitutes 1.63 percent of the total

reporting area with around 1.28 lakh hectares, land under still water and water logged area jointly constitutes 1.78 lakh hectares or 2.27 percent. The area under Social forestry was only 0.13 lakh hectare or 0.16 percent of the total reporting area.

The Gross Cropped Area recorded increase to 41.05 lakh hectares from 39.99 lakh hectares in 2008-09. In 2007-08 the Gross Cropped Area in the State was 38.39 lakh hectares. The Gross Cropped Area in the State, thus show 6.93 percent during the year 2009-10 over 2007-08.

The area sown more than once and the net cropped area recorded 19.15 percent and 2.11 percent increase with 12.94 lakh and 28.11 lakh hectares during the year 2009-10 over the figures of 2007-08. Thus, it reveals from the above that the ratio of area sown more than once to the net area sown was just above 46 percent as against 39.45 percent during the year 2007-08. The ratio of area more than once to the net sown area in the State was 42.28 percent during 2008-09.

The ratio of net sown area to gross cropped area, on the other hand, was calculated at 68.48 percent during the year 2009-10 compared to 71.71 percent during the year 2007-08. During the year 2008-09 the ratio of net sown area to gross cropped area was 70.28 percent.

(i)Agricultural Holding

According to the Agricultural Census, 2005-06 there were 27.5 lakh operational holdings in Assam covering an operated area of 30.49 lakh hectares of land compared to 27.1 lakh operational holdings covering an operated area of about 31.1 lakh hectares of land in 2000-01. The Table 5.12 depicts the trend of number of holding and area between the two Agricultural censuses, 1995-96 and 2000-01 (Table 4.3).

As per the Agricultural Census, 2005-06, the marginal holdings with less than one hectare of land accounted for 63.7 percent of the total holdings and 24.9 percent of the total operated area of the State in 2005-06. The small holding with size class between 1-2 hectares, shared 21.5 percent of the total holdings and 23.6 percent of the total operational area. On the other hand, the large holdings (10 hectares and above)

constituted only 0.18 percent of the total number of holdings and 9.8 percent of the total operated area in the State.

Table: 4.3
Agricultural Holding in Assam: 2000-2006

Size class (In hectare)	Number of holding		Percentage Change	Area operated (in hectare)		Percentage Change
	2000-01	2005-06		2000-01	2005-06	
Marginal (Below 1.0)	1699107	1752989	(+) 3.17	662780	760145	(+) 14.69
Small (1.0-2.0)	561039	591431	(+)5.42	730513	718383	(-) 1.66
Semi-medium (2.0-4.0)	351521	317859	(-)9.6	957959	846006	(-)11.69
Medium (4.0-10.0)	95500	82933	(-) 13.2	498797	425403	(-)14.71
Large (10.0 & above)	4970	4902	(-) 1.4	263529	298606	(+) 13.31
Total	2712137	2750114	(+) 1.4	3113578	3048543	(-) 2.09

Source: Directorate of Economics and Statistics, Assam.

(j)Agricultural Production

The area covered under Paddy cultivation was 25.71 lakh hectares and more than 91 percent of the total area under foodgrains in the State during the year 2010-11. During the year 2010-11, the productivity of Winter Rice has increased to 1993 Kg. per hectare from 1894 Kg. per hectare i.e.more than 5 percent increase in productivity per hectare. The yield rate of Autumn Rice has been expected to reach all time high with 1155kg/hectare which is 17.6 percent above the yield rate of 982 kg/hectare in 2009-10. The productivity of Summer Rice has also continued to maintain its increasing trend by more than 18 percent in 2010-11 over the previous year. As a result of effect of yield rate, the production of Rice, the most important cereal crop grown in the State, has increased to 50.33 lakh tones in 2010-11 from 44.09 lakh tonnes in 2009-10 registering about 14 percent increase in Rice production in the State as compared to the previous year.

As per available estimates, the production of total foodgrains in the State was 51.78 lakh tonnes during 2010-11 as against 45.57 lakh tonnes during 2009-10 showing an increase of Foodgrain production of 13 percent over the previous year. The increase in the production of Pulses in 2010-11, has recorded 9.1 percent over 2009-10. During the same period, the production of oilseeds has also increased by 8.4 percent as compared to the previous year.

Horticultural crop in the state occupy about 15 percent gross cultivated area and annually produces more than 15.0 lakh MT of fruits, 44.0 lakh MT of vegetables and 2.0 lakh MT of spices besides nut crops, flowers and medicinal & aromatic plants thus contributing significantly towards food and nutritional security of the State. The Index of Agricultural Production (base triennium ending 1981-82=100) for the State increased to 201 for all commodities, including food and non-food items, in 2010-11 as against 186 in 2009-10. Index of Agricultural Production (Base triennium ending 1981-82=100) for the State stands at 201 in 2010-11 compared to 186 in 2009-10. The Index of Agricultural Production for the State was 170 in 2008-09. The All India Agricultural Production Index, on the other hand, stands at 179 (Base Triennium ending 1993-94=100) in 2010-11. The table 4.4 shows the trend of Index of Agricultural Production in the State for the last ten years.

(k)Irrigation

The achievement made by Irrigation Department in creation of additional irrigation potential has not been much encouraging as per available report. Out of the Gross Cropped Area of 41.05 lakh hectare of the State, the State Irrigation Department created potential of 7.97 lakh hectare till 2010-11 and out of which 1.30 lakh hectare irrigation potential was utilised during the year. It has been worth mentioning that the State Agriculture Department has also created a potential of 6.84 lakh hectares through the Shallow Tubewells and Low Lift Points out of which 4.70 lakh hectare are covered under utilisable/assured irrigation.

(l)Fishery

There are about 3.91 lakh hectare of water area in the State in the form of rivers, beel, derelict water bodies and ponds and tanks. The scientific fish farming is practiced generally in individual and community tanks. There is a positive trend in fish productivity during recent past. During the year 2010-11, the fish production has reached the tune of 2.32 lakh metric tons against 2.18 lakh metric tons fish produced in 2009-10.

Table: 4.4
Index of Agricultural Production in Assam: 2001-2011

Year	Food	Non-Food	All Commodities
2001-02	169	160	164
2002-03	164	166	165
2003-04	170	162	166
2004-05	152	154	153
2005-06	155	148	153
2006-07	128	156	142
2007-08	145	161	153
2008-09	174	167	170
2009-10	192	180	186
2010-11	218	184	201

Source: Directorate of Economics and Statistics. Assam.

(m)Forest

The total Forest area excluding unclassed State Forest is 20092 sq km and 3778 sq km area is under protected area as reported by State Forest Department. Thus, the reserved forest area constitutes around 18 percent and total forest area excluding unclassed forest with constitutes around 26 percent of the total geographical area of the State. As per Forest profile of the State, the Reserved Forest area and Proposed Forest area is 14212 sq km and 2102 sq km respectively in 2010-11.

(n)Livestock and Veterinary

As per estimation, the number of Indegeneous Cattle is 7762572 and Crossbreed Cattle numbered 446185 in the State during 2009-10 as reported by State Animal Husbandry and Veterinary (AH&V)Department. The estimate also shows that the population of Buffalo and Goat is 571756 and 2828529 respectively. The AH&V Department has also published the estimated figure of Fowl and Duck as 7942817 and 3106136 respectively during the same year. The milk production in the State during 2010-11 was estimated at 832 million liters. The egg and meat production were estimated at 470 million numbers and 34000 M.T. respectively during the same period.

(o)Industry

The Industrial scenario of the State is mainly confined within the growth of employment oriented Small Scale Sector, which comprises of manufacturing and processing industries. The contribution of manufacturing sector to Gross State Domestic Product is estimated at 7.0 percent during 2010-11 which is not encouraging. The total SSI/MSME units in the State numbered 34327 are providing employment to 178054 persons till the year 2010-11. In 2009-10, the value of produced goods of 1214 number SSI units was worth ₹916.79 crores. During the year the number of factories registered was 4262 and provided employment to 150485 persons. The growth of Manufacturing Sector is estimated at 3.8 percent at constant (2004-05) prices and 9.0 percent at current prices in 2010-11 over previous year. The General Index of Industrial Production of the State has shown upliftment to 157.37 in 2010-11 (Base 1999-2000) from 155.83 in 2009-10.

The Tea Industry of Assam, playing a vital role in the State as well as in the national economy. The Assam's Tea industry also possesses a significant reputation in the global economy. The total area under tea cultivation is accounting for more than half of the country's total area under tea and the Tea Industry of Assam provides average daily employment to more than six lakh persons in the State which is around 50 percent of the total average daily number of labour employed in the country. The Tea Gardens in the State are covering land of 322000 Hectares out of 578000 Hectares of

land in the country as a whole. The estimated tea production of the State was 4875 lakh kg. as against 9808 lakh kg. total tea produced in the country during the year 2008 as per report of Tea Board of India. The tea production in Assam constitutes more than 50 percent of the total production of the country.

Among the Plantation crops, Rubber cultivation is also gaining its popularity in the State due to congenial agro climate as well as its eco-friendly activity. The 10213 MT rubber productions covered an area of 27083 Hectares and employment generated of 2767450 man days in the year 2010-11.

Traditionally, Sericulture, a major cottage industry of the State, is practiced in more than 10532 villages and provided employment to more than 2.5 lakh of family. Assam has the monopoly in production of Muga, the Golden Silk in the world and 99% of Muga Silk produced in Assam. Assam has also achieved the right of "Geographical Indication" in Muga Silk.

(p)Public Distribution System

Under the Public Distribution System the State has a network of 34,536 Fair Price Shops as on March 2011, out of which 30,506 are located in rural areas and 4030 in urban areas. On an average, each shop covers 898 persons. The State has achived target of selecting 19.06 lakh beneficiaries from BPL families by providing BPL PDS item at subsidized rate.

4.1.2 Profile of Sample Population

In this section we look at various profiles of sample population. First of all the distribution of sample households is presented.

(a) Distribution of Sampled Households: The distribution of sampled households is presented in Table 4.5. Out of a total 602 sampled households 93 Households (16 percent) are sampled from Cachar District, 165 Households (27 percent) are sampled from Kamrup Metropolitan District, 101(16 percent) and 105 (18 percent) Households are sampled from Dibrugarh and Nagaon District respectively, 88 Households (15

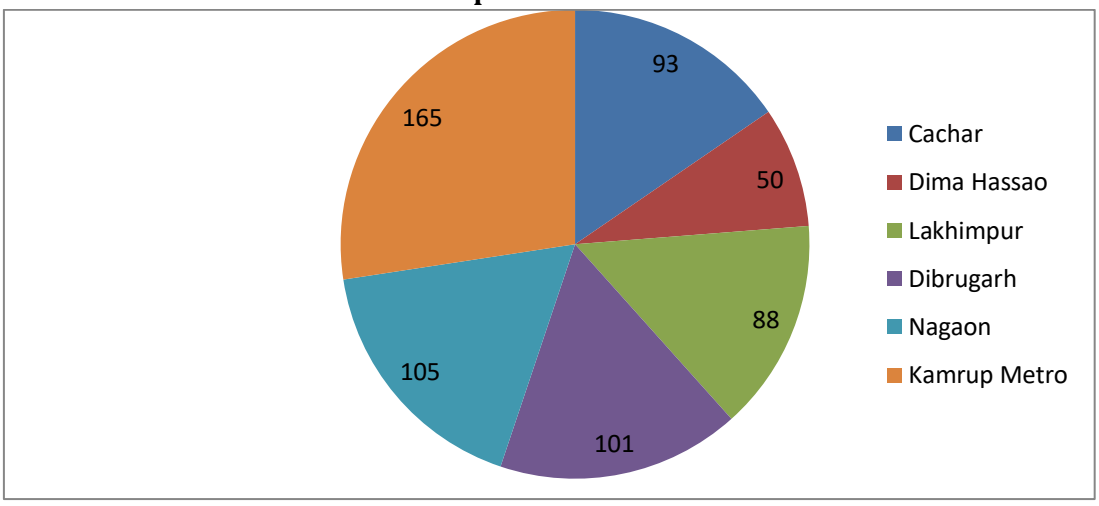
percent) are sampled from Lakhimpur District and rest(8 percent) are from Dima Hasao District (Table 4.5). This is illustrated in Chart 4.1.

Table: 4.5
Distribution of Sample Households in Assam: 2014-15

Agro-Climatic Zone	District	Village	Total Number of Households	Number of Households Sampled
Barak Valley	Cachar	Kanakpur Part II	931	93(16)
Hill Region	Dima Hasao	Rongartingslum	496	50(8)
North Bank Plain	Lakhimpur	Bocha Gaon	880	88(15)
Upper Brahmaputra Valley	Dibrugarh	Muhundi	1013	101(16)
Central Brahmaputra Valley	Nagaon	Barkhat Gaon	1045	105(18)
Lower Brahmaputra Valley	Kamrup Metropolitan	Digarubar Gaon	1646	165(27)
Total				602(100)

Source: Primary Survey, 2014-15
Note: Figures in the parenthesis indicate percentage of total sampled households

Chart: 4.1
Distribution of Sample Households in Assam: 2014-15



Source: Primary Survey, 2014-15

(b) Characteristics of Sampled Villages: Characteristics of sampled villages are presented in the Table 4.6. Digarubar Gaon has an area of 2679 acres giving shelter to a population 9078, Bocha Gaon has an area of 679acres giving shelter to a population 3254, Muhundi has an area of 1254 acres giving shelter to a population 6085, Barkhat Gaon has an area of 1978 acres giving shelter to a population 5095, Rongartingslum has an area of 484 acres giving shelter to a population 2175, and Kanakpur Part II has an area of 876 acres giving shelter to a population 9078. All the sampled villages have access to basic educational facilities, medical facilities. All the sampled villages have accessibility to safe drinking water facilities, telecommunication facilities, banking or postal facilities. Main sources of incomes of the population are both farm and non-farm, Nature of employment are casual, self employment and regular. All varieties of rice such as autumn, winter and summer paddy are grown in almost all the selected villages except Rongartingslum where large scale jhum cultivation is performed (Table 4.6).

(c) Characteristics of Sample Population: The characteristics of sample population are illustrated in Table 4.7. From the table it becomes evident that, in the Kamrup Metreopolitian district 70 percent are working age population, 26 percent are child population. Average landholding is 0.79 acre per household. Coming to literacy rate, male literacy is 92 percent, female literacy is 63 percent with overall literacy of 77 percent. Sex ratio in the Kamrup Metropolitian stands at 983.

In the Kamrup Metreopolitian district 881 households have reported that they have adequate calorie availability. 695 households have proper food storage facility, 593 households have adequate food preparation techniques in the household, 930 household have access to safe drinking water facility and 786 household enjoyed proper sanitation facilities among per 1000 households.

In the Lakhimpur district 65 percent are working age population, 29 percent are child population. Average landholding is 1.78 acre per household. Coming to literacy rate, male literacy is 89 percent; female literacy is 69 percent with overall literacy of 78 percent. Sex ratio in the Lakhimpur stands at 896. In the Lakhimpur district 702 households have reported that they have adequate calorie availability. 560 households

Table: 4.6
Characteristics of Sampled Villages of Assam

Agro-Climatic Zones →		Lower Brahmaputra Valley	North Bank Plain	Upper Brahmaputra Valley
District →		Kamrup Metropolitian	Lakhimpur	Dibrugarh
Village → / Variables ↓		Digarubar Gaon	Bocha Gaon	Muhundi
Area[1] (in Hectares)		2679	679	1254
Population[1]		9078	3254	6085
SC Population[1]		-	397	663
ST Population[1]		1369	896	2213
Educational Facility[1]	Primary School	4	2	3
	Middle School	2	1	2
	High School	1	-	-
Medical Facility[1]	Health Centre	1	-	-
	PHC	1	-	-
	PHC Sub-centre	1	1	1
Drinking water Facility[1]		Well, Handpump, Tubewell	Well, Handpump, Tubewell	Well, Handpump, Tubewell
Paddy varieties grown[2]		Autumn, Winter and Summer Rice	Autumn, Winter and Summer Rice	Autumn, Winter and Summer Rice
Sources of Income[2]		Farm and Non-farm	Farm and Non-farm	Farm and Non-farm
Nature of Employment[2]		Casual, Regular and Self Employment	Casual, Regular and Self Employment	Casual, Regular and Self Employment
Condition of Approach Road[2]		Black Topped	Katcha	Katcha
Electrification Status[1]		Fully Covered	Fully Covered	Moderately Covered
Telecommunication Facility[1]		Fully Covered	Fully Covered	Fully Covered
Availability of Postal/ Banking Facility[1]		Yes	Yes	Yes

Table: 4.6(Continued)
Characteristics of Sampled Villages of Assam

Agro-Climatic Zones →		Central Brahmaputra Valley	Hill Region	Barak Valley
District →		Nagaon	Dima Hassao	Cachar
Village → / Variables ↓		Barkhat Gaon	Rongartingslum	Kanakpur Part-II
Area[1] (in Hectares)		1978	484	876
Population[1]		5095	2175	4566
SC Population[1]		-	189	590
ST Population[1]		479	1732	-
Educational Facility[1]	Primary School	2	2	3
	Middle School	1	1	2
	High School	-	-	-
Medical Facility[1]	Health Centre	-	-	-
	PHC	-	-	-
	PHC Sub-centre	1	1	1
Drinking water Facility[1]		Well, Handpump, Tubewell	Well, Handpump, Tubewell	Well, Handpump, Tubewell
Paddy varieties grown[2]		Autumn, Winter and Summer Rice	Summer Rice (Jhum)	Autumn, Winter and Summer Rice
Sources of Income[2]		Farm and Non-farm	Farm and Non-farm	Farm and Non-farm
Nature of Employment[2]		Casual, Regular and Self Employment	Casual, Regular and Self Employment	Casual, Regular and Self Employment
Condition of Approach Road[2]		Black Topped	Katcha	Katcha
Electrification Status[1]		Fully Covered	Partially Covered	Moderately Covered
Telecommunication Facility[1]		Fully Covered	Partially Covered	Fully Covered
Availability of Postal/ Banking Facility[1]		Yes	Yes	Yes

Source: [1] Village level Data, Office of Gaon Panchayet, Govt. of Assam (Sampled Villages)

[2] Primary Survey, Focus Group Discussions, 2014-15

have proper food storage facility, 517 households have adequate food preparation techniques in the household, 897 household have access to safe drinking water facility and 697 household enjoyed proper sanitation facilities among per 1000 households.

In the Dibrugarh district 58 percent are working age population, 29 percent are child population. Average landholding is 1.43 acre per household. Coming to literacy rate, male literacy is 84 percent; female literacy is 62percent with overall literacy of 73 percent. Sex ratio in the Dibrugarh stands at 870.

In the Dibrugarh district 554 households have reported that they have adequate calorie availability. 438 households have proper food storage facility, 495 households have adequate food preparation techniques in the household, 913 household have access to safe drinking water facility and 725 household enjoyed proper sanitation facilities among per 1000 households.

In the Nagaon district 55 percent are working age population, 33 percent are child population. Average landholding is 1.35 acre per household. Coming to literacy rate, male literacy is 86 percent; female literacy is 46 percent with overall literacy of 66 percent. Sex ratio in the Nagaon stands at 918. In Nagaon district 749 households have reported that they have adequate calorie availability. 640 households have proper food storage facility, 544 households have adequate food preparation techniques in the household, 887 household have access to safe drinking water facility and 772 household enjoyed proper sanitation facilities among per 1000 households.

In the Dima Hassao district 67 percent are working age population, 27 percent are child population. Average landholding is 0.56 acre per household. Coming to literacy rate, male literacy is 82 percent; female literacy is 65 percent with overall literacy of 74 percent. Sex ratio in the Dima Hassao stands at 942. In Dima Hassao district 832 households have reported that they have adequate calorie availability. 570 households have proper food storage facility, 479 households have adequate food preparation techniques in the household, 863 household have access to safe drinking water facility and 757 household enjoyed proper sanitation facilities among per 1000 households.

In the Cachar district 61 percent are working age population, 22 percent are child population. Average landholding is 1.20 acre per household. Coming to literacy rate, male literacy is 87 percent; female literacy is 62 percent with overall literacy of 74 percent. Sex ratio in the Cachar stands at 898. In Cachar district 814 households have reported that they have adequate calorie availability. 610 households have proper food

storage facility, 506 households have adequate food preparation techniques in the household, 912 household have access to safe drinking water facility and 735 household enjoyed proper sanitation facilities among per 1000 households.

(d)Activity Status of Sample Population: The activity status of sample population is presented in Table 4.8. From the Table, we see that 60 percent of sample population is total workers, while 16 percent are unemployed giving us 76 percent of total sample population as labour force. Among total workers 1 percent are in the age group less than 14 years, 32 percent are in the age group 15-29 years, 36 percent are in the age group 30-44 years, 27 percent are in the age group 45-59 years and 4 percent are in the age group 60 years and above. Among unemployed population 46 percent are in the age group 15-29 years, 22 percent are in the age group 30-44 years, 32 percent are in the age group 45-59 years and 4 percent are in the age group 60 years and above.

Among labour force 1 percent are in the age group less than 14 years, 35 percent are in the age group 15-29 years, 33 percent are in the age group 30-44 years, 28 percent are in the age group 45-59 years and 3 percent are in the age group 60 years and above. Among total non-workers 67 percent are in the age group 60 years and above. Among total sample population 0.7 percent are in the age group less than 14 years, 28 percent are in the age group 15-29 years, 28 percent are in the age group 30-44 years, 25 percent are in the age group 45-59 years and 18 percent are in the age group 60 years and above (Table 4.8).

Table: 4.7
Characteristics of Sample Population of Assam

Agro-Climatic Zones	District	Working age Population (15-59) (in percentage)	Child Population (0-14) (in percentage)	Adult Population (60+) (in percentage)	Average landholding/HH (in acre)	Literacy Rate		
						Male	Female	Person
Lower Brahmaputra Valley	Kamrup Metropolitian	70	26	4	0.79	91.73	63.16	77.45
North Bank Plain	Lakhimpur	65	29	6	1.78	89.13	68.79	78.96
Upper Brahmaputra Valley	Dibrugarh	58	29	13	1.43	83.9	61.82	73.25
Central Brahmaputra Valley	Nagaon	55	33	12	1.35	86.36	46.43	66.4
Hill Region	Dima Hassao	67	27	6	0.56	82.43	65.43	73.93
Barak Valley	Cachar	61	22	17	1.2	87.1	61.82	74.46

Table: 4.7
Characteristics of Sample Population of Assam (Continued)

Agro-Climatic Zones	District	Sex Ratio	Adequate Calorie Availability (Per 1000 HH)	Proper food storage facilities (Per 1000 HH)	Adequate food preparation techniques (Per 1000 HH)	Access to safe drinking water (Per 1000 HH)	Proper Sanitation facility (Per 1000 HH)
Lower Brahmaputra Valley	Kamrup Metropolitian	983	881	695	593	930	786
North Bank Plain	Lakhimpur	896	702	560	517	897	697
Upper Brahmaputra Valley	Dibrugarh	870	554	438	495	913	725
Central Brahmaputra Valley	Nagaon	918	749	640	544	887	772
Hill Region	Dima Hassao	942	832	570	479	863	757
Barak Valley	Cachar	898	814	610	506	912	735

Source: Primary Survey, 2014-15

Table: 4.8
Activity Status of Sample Population of Assam: 2014-15

	Age Group																	
	Less than 14			15-29			30-44			45-59			60 and above			All age group		
	Male	Female	Person	Male	Female	Person	Male	Female	Person	Male	Female	Person	Male	Female	Person	Male	Female	Person
Total Workers	8 (0.5)	10 (0.66)	18 (1.16)	395 (26.2)	83 (5.5)	478 (31.7)	484 (32.1)	53 (3.5)	537 (35.6)	278 (18.5)	128 (8.5)	406 (27.0)	59 (3.9)	8 (0.5)	57 (4.4)	1224 (81.2)	282 (18.8)	1506 (100)
Un-employed	0 (0.0)	0 (0.0)	0 (0.0)	181 (42.2)	17 (4.0)	198 (46.2)	56 (13.1)	38 (8.9)	94 (22.0)	105 (24.5)	32 (7.5)	137 (32.0)	0 (0.0)	0 (0.0)	0 (0.0)	342 (79.7)	87 (20.3)	429 (100)
Labour Force	8 (0.41)	10 (0.52)	18 (0.93)	576 (29.8)	100 (5.2)	676 (35.0)	540 (27.9)	91 (4.7)	631 (32.6)	383 (19.8)	160 (8.3)	543 (28.1)	59 (3.0)	8 (0.4)	67 (3.4)	1566 (80.9)	369 (19.1)	1935 (100)
Total Non-worker	0 (0.0)	0 (0.0)	0 (0.0)	26 (4.4)	17 (2.9)	43 (7.3)	58 (9.8)	9 (1.5)	67 (11.3)	78 (13.1)	8 (1.3)	86 (14.4)	347 (58.4)	51 (8.6)	398 (67.0)	509 (85.7)	85 (14.3)	594 (100)
Total Sample Population	8 (0.3)	10 (0.4)	18 (0.7)	602 (23.8)	117 (4.6)	719 (28.4)	598 (23.6)	100 (4.0)	698 (27.6)	461 (18.2)	168 (6.6)	629 (24.8)	406 (16.1)	59 (2.3)	465 (18.4)	2075 (82.0)	454 (18.0)	2529 (100)

Source: Primary Survey, 2014-15

Note: Figures in the parenthesis represent percentages of row total

(e)Social Characteristics of Sample Population: Various characteristics of sample population are illustrated in Table 4.9. Coming to the religion profile of sampled households, almost 91 percent of the sampled households belong to Hindu religion, 3 percent of the households reported that they have Christian religion and 6 percent of the households are Muslims. In case of caste structure, nearly 83 percent of the total households belong to the backward classes of which 6 percent of the household belong to Scheduled Caste, 13 percent of the households belong to Scheduled Tribe Category and nearly 64 percent of the households belong to other backward classes. 17 percent of the total households belong to the general category. Based on economic standing, almost 50 percent of the households emerged as medium income households, while 22 percent of the household are being classified as low income households. The division of the households is done on the basis of total monthly family income from all sources.

In respect of gender structure of the sample households 480(80 percent) households are male headed i.e. the head of the household is male. And rest 122 (20 percent) households are female headed. A detailed division of the sampled households on the basis of family size yields that almost 60 percent of the household have family members less than or equal to four. 238 households have family size of 4-8. Only 5 households can be termed as large families having more than 8 members. The average family size for the whole sample turned out to be 4. While analyzing the educational level, literacy is prominent in male headed households. In higher education front also male headed households take a lead from female headed households. 25 percent of the household heads have educational level up to secondary, 20 percent of the household heads have educational level up to higher secondary, 15 percent of the household heads have acquired graduate and higher levels of education. In case of male headed households, 51 percent of the household heads have educational level below higher secondary while the corresponding figure for female headed households is 65 percent.

In case of male headed households, only 16 percent of the household heads have acquired graduate and higher levels of education while the corresponding figure for female headed households is 14 percent.

Land is a very important asset for rural households. The sampled households are being classified into six groups on the basis of size of landholdings landless, sub-marginal (less than 0.5 hectares), Marginal (between .5 hectares and 1 hectares), small (between 1 and 2 hectares), medium(between 2 and 4 hectares) and large(4 hectares and above). Landlessness is found to be quite rampant among the sampled households. On an average, 68 percent of the sampled households reported that do not possess any agricultural land. Among the households that were in possession of agricultural land 2.3 percent owned sub-marginal holdings, while 20 percent of the households belong to the category of marginal landowners. 7.5 percent of the households belong to the category of small landowners, 1.2 percent of the households belong to the category of medium category landowners.

The patterns of ownership of agricultural land appear to be of significance in influencing the choice of occupation by rural workers. Occupational classification of rural households reveals that engagement in nonfarm activities is found to be relatively higher among workers belonging to landless households. As far as occupational distribution is concerned, 23 percent of the households derive their livelihood solely from the farm sources, while 69 percent of the households derive their livelihood solely from the non-farm sources. 8 percent of the households derive their livelihood from both farm and non-farm sources (Table 4.9).

(f) Religion Profile of Sample Population by Family Size: Religion Profile of Sample Population by family Size is presented in the Table 4.10. From the Table in Kamrup Metropolitian district, in the Hindu people 67 percent have small family size, 58 percent have medium family size and 5 percent have large family size. In Lakhimpur district, in the Hindu people 46 percent have small family size, 55 percent have medium family size.

In Dibrugarh district, in the Hindu people 16 percent have small family size, 79 percent have medium family size and 5 percent have large family size. In Nagaon district, in the Hindu community people 10 percent have small family size, 73 percent have medium family size and 7 percent have large family size and in the Muslim community people 1 percent has small family size, 7 percent have medium family size

and 2 percent have large family size with 9.6 percent of the total belonging to Muslim community.

Table: 4.9
Characteristics of Sample Population: 2014-15

		Number of Households	Percentage of Total
Religion	Hindu	551	91.53
	Muslim	36	5.98
	Christian	15	2.49
Caste	General	100	16.61
	SC	38	6.31
	ST	78	12.96
	OBC	386	64.12
Economic Standing	Low	158	26.25
	Medium	306	50.83
	High	138	22.92
Gender Structure	Male Headed	480	79.73
	Female Headed	122	20.27
Family Size Structure	Small	359	59.63
	Medium	238	39.53
	Large	5	0.84
Land Owning Status	Landless	411	68.5
	Sub marginal	14	2.3
	Marginal	122	20.2
	Small	45	7.5
	Medium	7	1.2
	Large	2	0.3

Table: 4.9
Characteristics of Sample Population: 2014-15(Continued)

		Number Of Households	Percentage of Total
Educational Status	Illiterate	14	2.33
	Primary	85	14.12
	Middle	137	22.76
	Secondary	152	25.25
	Higher Secondary	122	20.27
	Graduate And Higher	92	15.27
Occupational Distribution	Farm	139	23.09
	Non-Farm	412	68.44
	Farm & Non-Farm	51	8.47
Total		602	100.00

Source: Primary Survey, 2014-15

In Dima Hassao district 70 percent belong to Hindu community while 30 percent are from Christian community. In the Hindu community 16 percent have small family size, 50 percent have medium family size and 4 percent have large family size and in the Christian community 26 percent have medium family size and 4 percent have large family size.

(g) Caste Structure of Sample Population by Family Size: Caste structure of Sample Population by family Size is presented in the Table 4.11. From the table in Kamrup Metropolitian district, in the General category 16 percent have small family size, 9 percent have medium family size and 0.6 percent have large family size, in the SC category 0.6 percent have small family size, 0.6 percent have medium family size and 3 percent have large family size, in the ST category 1.2 percent have small family size, 5.5 percent have medium family size and 0.6 percent have large family size, and in the OBC category 19 percent have small family size, 42 percent have medium family size and 1 percent have large family size.

In Lakhimpur district, in the General category 21 percent have small family size, 14 percent have medium family size, in the SC category 3.4 percent have small family size, 8.0 percent have medium family size, in the ST category 4.5 percent have small family size, 9 percent have medium family size, and in the OBC category 17 percent have small family size, 24 percent have medium family size.

In Dibrugarh district, in the General category 8 percent have small family size, 14 percent have medium family size, in the SC category 1 percent has small family size, 2 percent have medium family size and 3 percent have large family size, in the ST category 2 percent have small family size, 6 percent have medium family size and 1 percent have large family size, and in the OBC category 3 percent have small family size, 64 percent have medium family size and 2 percent have large family size.

In Nagaon district, in the General category 8 percent have small family size, 11 percent have medium family size and 5 percent have large family size, in the SC category 2 percent have medium family size and 1 percent have large family size, in the ST category 0.9 percent have small family size, 2.9 percent have medium family size and 0.9 percent have large family size, and in the OBC category 2.9 percent have small family size, 63.9 percent have medium family size and 1.9 percent have large family size.

In Dima Hassao district, in the General category 2 percent have small family size, 4 percent have medium family size and 2 percent have large family size, in the ST category 10 percent have small family size, 66 percent have medium family size and 4 percent have large family size, and in the OBC category 4 percent have small family size, 6 percent have medium family size and 2 percent have large family size.

In Cachar district, in the General category 20 percent have small family size, 42 percent have medium family size and 1 percent have large family size, in the SC category 5.4 percent have small family size, 3.2 percent have medium family size and 4.3 percent have large family size, and in the OBC category 3 percent have small family size, 12 percent have medium family size and 9 percent have large family size (Table 4.11).

Table: 4.10
Religion Profile of Sample Population by Family Size in Assam: 2014-15

Agro-Climatic Zones	District	Hindu				Muslim			
		Small	Medium	Large	All	Small	Medium	Large	All
Lower Brahmaputra Valley	Kamrup Metropolitian	61 (37.0)	95 (57.5)	9 (5.5)	165 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
North Bank Plain	Lakhimpur	40 (45.5)	48 (54.5)	0 (0.0)	88 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Upper Brahmaputra Valley	Dibrugarh	16 (15.8)	80 (79.2)	5 (5.0)	101 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Central Brahmaputra Valley	Nagaon	11 (10.4)	77 (73.3)	7 (6.7)	95 (90.4)	1 (1.0)	7 (6.7)	2 (1.9)	10 (9.6)
Hill Region	Dima Hassao	8 (16.0)	25 (50.0)	2 (4.0)	35 (70.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Barak Valley	Cachar	27 (29.0)	35 (37.6)	4 (4.3)	66 (70.9)	0 (0.0)	18 (19.4)	9 (9.7)	27 (29.1)
TOTAL		163 (27.1)	360 (59.8)	27 (4.5)	550 (91.4)	1 (0.2)	25 (4.2)	11 (1.8)	37 (6.1)

Table: 4.10
Religion Profile of Sample Population by family Size in Assam: 2014-15(Continued)

Agro-Climatic Zones	District	Christian				TOTAL
		Small	Medium	Large	All	
Lower Brahmaputra Valley	Kamrup Metropolitian	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	165 (100)
North Bank Plain	Lakhimpur	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	88 (100)
Upper Brahmaputra Valley	Dibrugarh	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	101 (100)
Central Brahmaputra Valley	Nagaon	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	105 (100)
Hill Region	Dima Hassao	0 (0.0)	13 (26.0)	2 (4.0)	15 (30.0)	50 (100)
Barak Valley	Cachar	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	93 (100)
TOTAL		0 (0.0)	13 (2.1)	2 (0.3)	15 (2.5)	602 (100)

Source: Primary Survey, 2014-15
Note: Figures in the parenthesis represent percentages of row total

Table: 4.11
Caste Structure of Sample Population by Family Size: 2014-15

Agro-Climatic Zones	District	SOCIAL CATEGORY							
		GENERAL				SCHEDULED CASTE			
		Small	Medium	Large	All	Small	Medium	Large	All
Lower Brahmaputra Valley	Kamrup Metropolitian	26 (15.8)	15 (9.1)	1 (0.6)	42 (25.5)	1 (0.6)	1 (0.6)	5 (3.0)	7 (4.2)
North Bank Plain	Lakhimpur	18 (20.5)	12 (13.6)	0 (0.0)	30 (34.1)	3 (3.4)	7 (8.0)	0 (0.0)	10 (11.4)
Upper Brahmaputra Valley	Dibrugarh	8 (7.9)	14 (13.9)	0 (0.0)	22 (21.8)	1 (1.0)	2 (2.0)	3 (3.0)	6 (6.0)
Central Brahmaputra Valley	Nagaon	8 (7.6)	12 (11.4)	5 (4.8)	25 (23.8)	0 (0.0)	2 (1.9)	1 (0.9)	3 (2.8)
Hill Region	Dima Hassao	1 (2.0)	2 (4.0)	1 (2.0)	4 (8.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Barak Valley	Cachar	19 (20.4)	39 (41.9)	1 (1.0)	59 (63.3)	5 (5.4)	3 (3.2)	4 (4.3)	12 (12.9)
TOTAL		80 (13.3)	94 (15.6)	8 (1.3)	182 (30.2)	10 (1.7)	15 (2.5)	13 (2.2)	38 (6.4)

Table: 4.11
Caste Structure of Sample Population by Family Size: 2014-15(Continued)

Agro-Climatic Zones	District	Social Category								Total
		Scheduled Tribe				Other Backward Class				
		Small	Medium	Large	All	Small	Medium	Large	All	
Lower Brahmaputra Valley	Kamrup Metropolitian	2 (1.2)	9 (5.5)	1 (0.6)	12 (7.3)	32 (19.4)	70 (42.4)	2 (1.2)	104 (63.0)	165 (100)
North Bank Plain	Lakhimpur	4 (4.5)	8 (9.1)	0 (0.0)	12 (14.6)	15 (17.0)	21 (23.9)	0 (0.0)	36 (40.9)	88 (100)
Upper Brahmaputra Valley	Dibrugarh	2 (2.0)	6 (5.9)	1 (1.0)	9 (8.9)	5 (4.9)	58 (57.4)	1 (1.0)	64 (63.3)	101 (100)
Central Brahmaputra Valley	Nagaon	1 (0.9)	3 (0.9)	1 (0.9)	5 (4.7)	3 (2.9)	67 (63.9)	2 (1.9)	72 (68.7)	105 (100)
Hill Region	Dima Hassao	5 (10.0)	33 (66.0)	2 (4.0)	40 (80.0)	2 (4.0)	3 (6.0)	1 (2.0)	6 (12.0)	50 (100)
Barak Valley	Cachar	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.2)	11 (11.8)	8 (8.8)	22 (23.8)	93 (100)
TOTAL		14 (2.3)	59 (9.8)	5 (0.8)	78 (12.9)	60 (10.0)	230 (38.2)	14 (2.3)	304 (50.5)	602 (100)

Source: Primary Survey, 2014-15
Note: Figures in the parenthesis represent percentages of row total

4.2 Intra-regional Food Security in Assam: 2001-2011

Our health: both mental and physical depend on the food we eat. It is this importance of food for human existence which brings the concept of food security in great significance. To gauge the status of food security an analysis across regions in Assam is undertaken in this section. Before analyzing the food security status the procedure followed in data analysis are elaborated below.

4.2.1 Food Security: The Analytical Framework

Food security is a complex phenomenon. It is mainly the interaction of four aspects of food availability, food access and food utilization and stability which results in a situation of food security.

(a)Food Availability

One of the premiere conditions of food security is ensuring food availability for the populace. Food availability is thus concerned with the availability of enough food to feed the population of a particular locality. For capturing various aspects of food availability across regions (agro climatic zones) in the state of Assam following sub-indicators has been chosen.

(i) Per Capita Value of Agricultural Production: Foodgrains are considered to be of paramount significance for food security, the reason being that cereals and pulses are staple foods and there are no perfect substitutes for them (Chand, 2007). Foodgrains are also the cheapest source of energy compared to other foods and are indispensable for the food security of low income classes (Chand and Kumar, 2006) and these are provided by agriculture. So, agricultural output can be taken as an indicator reflecting availability of food. Since agriculture is dependent on climate, therefore we have taken an average of three years' data of agricultural production to take into account the variability of production. Food and non-food production both being included since non-food production would contribute to the income of households and therefore have an impact on food security.

However because of non-availability of adequate data we have considered only the selected agricultural products. The value of each selected food and non food item is derived by multiplying the amount of production with its price obtained from all India prices of these items at constant 1993-94 prices. Adding the value of each and every food and non-food item gives the overall value of agricultural output for a year. To account for variations in population, the per capita value of agricultural production is calculated. The assumption on taking the variable 'Per capita value of agricultural production' is that a region (agro climatic zone) with higher value is expected to be more food secure in terms of food availability.

(ii) Irrigation Extent: Irrigation has a key role in both stabilizing agricultural production and, through an increase in cropping intensity and an associated increase in productivity, thus improving a region's food security position. It also provides a better prospect in terms of rural employment. Thus, to assess the irrigation extent we have taken the variable namely 'Percentage of irrigated area to net area sown.' It is expected that irrigation extent is positively associated with food security situation.

(iii) Use of Fertilizer: In underdeveloped regions which are reeling under population pressure with no additional cultivable land are forced to increase their fertilizer consumption. In agriculture solar energy is converted into chemical energy. It is with the help of chlorophyll in plants that more food is produced. However, for doing this plants need adequate supply of nutrients such as N, P and K etc. Fertilizers are the chemicals that supply these essential plant nutrients. However, with the application of more and more HYV crops, it is not possible for most soils to supply the needed amounts of plant nutrients and that is why more and more use of fertilizers are needed to avail a greater level of agricultural production (Joseph et. al, 1992) of course too much use may lead to harmful effects. For this purpose we have taken the 'Per hectare consumption of fertilizer (in Kg.)' as a variable with the expectation that it is positively associated with the food security.

(iv)Proportion of Forests: Forests are a form of common property resource. Availability of forest area can affect food security as access to forest products provides income and supports nutrition, depending on the type and magnitude of the produce. But there are both legal and geographical restrictions on developing production in forest areas. Thus, it can be assumed that forest area is negatively associated with food security, since it limits the extension of agricultural production. Thus we have taken the variable namely 'Percentage of non-forest area in total area in the region.'

(v) Road Connectivity: Access to paved roads has a big role in development. It can reduce transaction costs, with possible positive results on the prices realized by farmers. By improving communication, roads can increase the options available to rural producers, connecting them with larger regional markets. Studies of rural roads have shown that they raise the productivity and value of land for poor farmers (Jacoby, 2000). It has been found that government spending on rural infrastructure, besides agricultural research and development, irrigation and rural development programmes targeted to the rural poor, have all contributed to reductions in rural poverty and increases in agricultural productivity. Marginal government expenditure on roads, in particular, has been found to have the largest positive impact on productivity growth (Fan et al., 1999). So, we have taken the variable 'Road length per lakh of population' to signify the road connectivity status in a region with the assumption that it has positive association with food security situation.

(b) Food Accessibility

Having sufficient food at national or at regional level cannot be taken as confirmation that all people in the region have enough food to eat. Food accessibility is another dimension of food security. It addresses whether people residing in a certain region have enough resources to grasp appropriate quantity of food for its existence. For capturing various aspects of food accessibility across region (agro climatic zone) in the state of Assam following sub-indicators have been chosen.

(i) Percentage of population above Poverty line: The poorest of the poor section of the community which has been marginalized on the basis of the level of poverty i.e BPL household members, are in the worse state and represents the last persons in terms of deficiency of even the lowest minimum level of living required for mere existence. This problem of the BPL households is so grave that they are not only far away from meeting their minimum economic needs and requirements but also faces the crisis of food security more in terms of accessibility of food (Kandari, 2015). So we have taken "Percentage of above poverty line population' as a variable for measuring the extent of accessibility of food as a APL household is assumed to have more access to food and thus positively associated with the food security.

(ii) Proportion of main workers in total workers: Work is the most important determinant of living standards around the world. For the vast majority of people, their work is the main source of income and a key driver of poverty reduction. 'Work' was defined as participation in any economically productive activity. Such participation was physical or mental in nature. According to this definition, the entire population has been classified into three main categories, i.e., Main workers, Marginal workers and Non- workers.

Main workers are those who had worked for the major part of the year (for 183 days or more during the year) preceding the date of enumeration while marginal workers were those who worked any time at all in the year preceding the enumeration but did not work for a major part of the year and Non-workers were those who had not worked any time at all in the year preceding the date of enumeration. So, from the definitions it is clear that main workers generally enjoy sustained level of income through- out the year. Furthermore, as earnings increase, individual choices expand. Opportunities for gainful work, offer households the means to increase food consumption and also reduce its variability. Thus we have taken 'Proportion of main workers in total workers' as a variable for measuring the extent of accessibility of food and is assumed to be positively associated with the food security.

(iii) Proportion of non-Scheduled Tribes and Scheduled Castes Population: The ST and SC households are known to be generally more food insecure, largely on account

of their economic and social deprivation -the former on account of geographical marginalization and the latter due to historical deprivation and exclusion from mainstream - all resulting in political marginalization. The proportion of non ST and SC population in a district has been taken as an indicator against this marginalization. The assumption is that the greater the non ST and SC population in a across region (agro climatic zone) the more it is associated with food security.

(iv) Female Literacy: It is well-known that there are gender-based inequalities in food consumption and hence on accessibility. The existence of such gender-based inequalities in food consumption is attested by numerous case studies (Agarwal, 1994). The very high incidence of Anaemia among women and girls shows that females are generally nutritionally deficient. We have used the female literacy rate as the variable to represent gender-based inequality in food consumption. The argument is that a higher literacy rate for women is more likely to enable women to enhance their roles in decision-making and increase their share of food consumption. At the same time, higher women's literacy is also likely to lead to better knowledge of nutritional systems and improved health practices.

(v) Electrification Status: Introducing electricity into different people's domestic/household, industrial, irrigation equipment, commercial, street light and office use provides the necessary infrastructure for accelerated economic activities as well as creating environment for realizing human capabilities (Nelson, 2003). Electrification boosts both farm and non-farm sector. The use of various electrical irrigation pumps, tube wells improves the agricultural production while the use of electricity at various agro based industries and other small scale industries helps in increasing productivity levels of these industries and hence income of the entrepreneurs. As in Assam agriculture is not well developed and still uses traditional practices and hence the impact of electricity on non agricultural activities becomes vital in such a case. So we have taken the 'Percentage of villages electrified in a district' as variable since it has positive effect on income and ultimately on food access.

(c) Food Utilization

Getting enough food available to feed and having adequate resources to grasp it does not ensure food security. Food utilization is another dimension of food security. It is concerned with proper utilization of food so that its nutritional value gets used in an optimum manner. For capturing various aspects of food utilization across region (agro climatic zone) in the state of Assam following sub-indicators has been chosen.

(i)Access to Safe drinking Water: Polluted and contaminated water undermines the safety and the nutritional well-being of individuals and hence reduction of the proportion of people without access to safe drinking water by half has been mentioned as part of the seventh Millennium Development Goal. Clean and safe water supply is also an essential element for achieving food security and good nutrition. Empirical studies have shown that water quality is a big problem and the availability of good quality water is a big factor that affects food security. So we have taken 'Percentage of households having access to safe drinking water' as a variable for assessing utilization dimension of food security.

(ii)Sanitation facilities: A lack of sanitation and hygiene contributes to a range of health problems. India has the highest rate of open defecation in world (WHO, 2010). Defecation near water sources and where food is being grown can spread disease (Gujjab and Shaik 2005). Almost two million children die each year because of lack of clean water and lack of-sanitation (UNICEF, 2007) and make more people vulnerable to diseases. The resulting sickness causes suffering and loss of opportunities to earn a living. So the benefits of foods cannot be utilized properly and hence the availability of proper sanitation facilities is a big factor that affects food security. So we have taken 'Percentage of households having access to proper sanitation facilities' as a variable for assessing utilization dimension of food security.

(d) Stability

Food security does not get ensured by the mere presence of food availability, accessibility and utilization. There must be some sort of stability in all respects i.e. people cannot be potentially termed as food secure until there is stability in respect of availability, accessibility and utilization of food. For capturing the stability dimension of food security one of the proxy variables that can be used is the standard of living of the people. For decent standard of living, a good living house is very essential, as housing forms an indispensible part of human dignity. So availability of permanent houses under the possession of a household is taken to be a measure for the standard of living of the people. Thus, we have taken 'The percentage of population having permanent houses' as a variable for measuring the stability dimension of food security.

(e) Composite Food Security Index

As food security encompasses food availability, accessibility, utilization and stability, so to capture all necessitates the creation of a composite food security index. It involves following steps.

STEP I. It consists in creation of food availability index, food accessibility index, food utilization index and finally stability index. The creation of each index involves two stages:

Stage I. The individual indicators/ variables chosen for the construction of FSI are measured in different units and hence, in general, cannot be added directly. It therefore becomes necessary to convert them to some standard units so that the initial scale chosen for measuring the indicators do not bias the results. This is done by calculating the following index based on UNDP's Max-Min approach for each variable.

$$\text{Variable index} = \frac{X_{ij} - X_{min}}{X_{max} - X_{min}} \; ; 0 \leq \text{Variable Index} \leq 1$$

Where X_{ij} = Actual value of the jth variable for the ith zone/ region

X_{min} = Minimum value of the jth variable

X_{max} = Maximum value of the jth variable.

Stage II. Dimensional Index for food security is calculated by taking the simple average of all the variable indices for that respective dimension. Symbolically,

$$DI = \frac{1}{n}\sum_{j=1}^{n} V_{ij} \quad ; 0 \leq V_{ij} \leq 1$$

Where, DI = Dimensional Index of food security.

V_{ij} = Value of the jth variable index of a particular dimension of food security for the ith region.

n = No. of variables / indicators of that particular dimension of food security.

STEP II. Finally the Food Security Index (FSI) for each of the agro-zones has been constructed by taking the simple average of dimensional indices i.e

$$FSI = \frac{Availabilty\ Index + Accessibility\ Index + Absorption\ Index + Stability\ Index}{4} \quad ;$$

$$0 \leq \text{FSI} \leq 1$$

Based on above procedure the food security index for 2001 as well as 2011 is computed. The information about various variables chosen to represent the food availability, accessibility, utilization and stability is compiled in Figure 4.1. Moreover, we have also compiled the data sources and reference year for each of the variables in Table 4.12

Figure: 4.1
Food Security Index

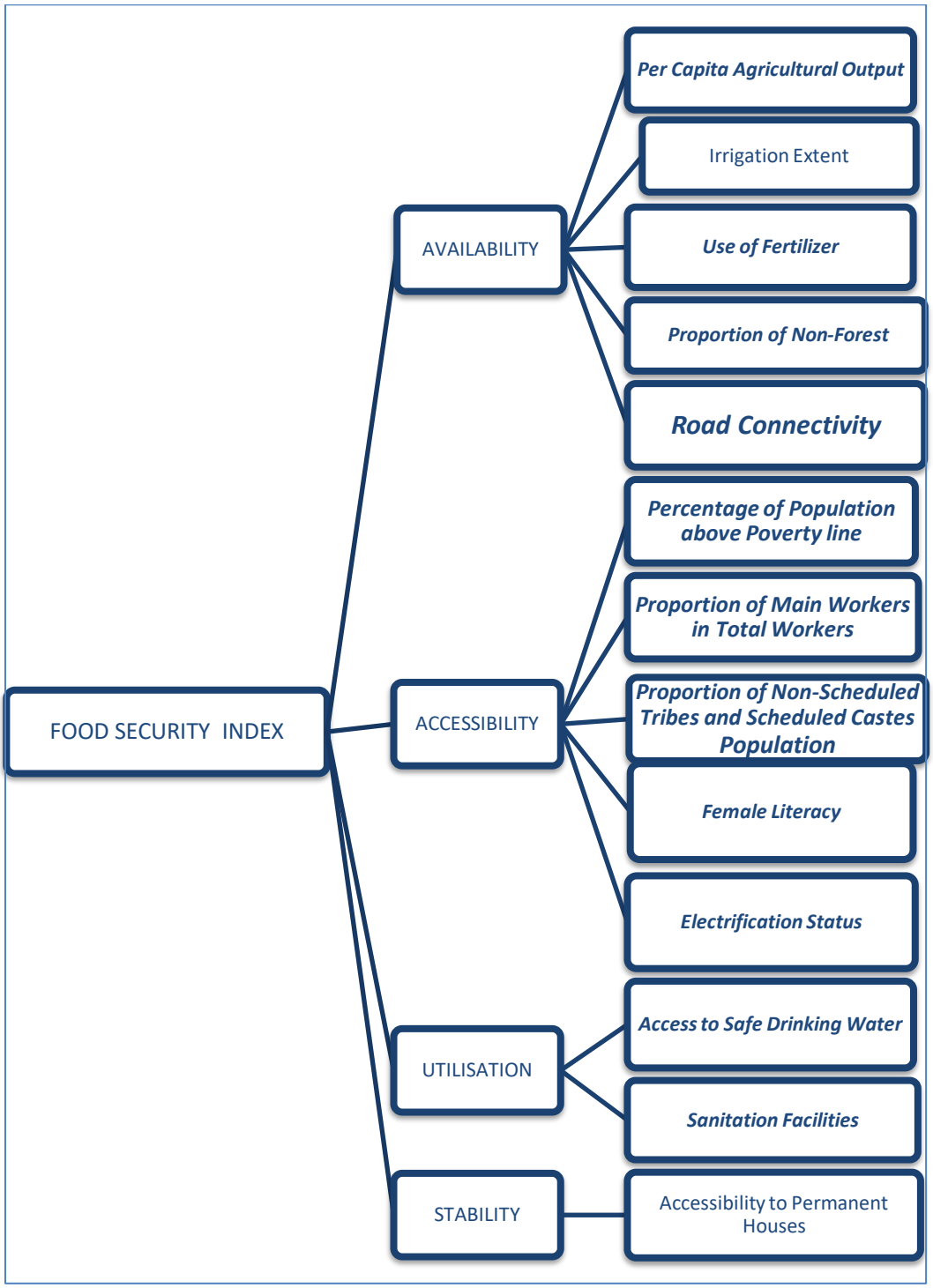


Table: 4.12
The Indicators, Source of Information and the Reference Year for Food Security Index

	Indicator	Variables	Source	Ref. Year
FOOD SECURITY INDEX	**Food Availability**	Per Capita Value of Agricultural Production	Directorate of Agriculture, Assam.	2001,2011
		Irrigation Extent	Directorate of Economics and Statistics, Assam	2001,2011
		Use of Fertilizer	Directorate of Economics and Statistics, Assam	2001,2011
		Proportion of Non-Forests	Population census of India	2001,2011
		Road Connectivity	Population census of India	2001,2011
	Food Accessibility	Percentage of population above Poverty line	Directorate of Economics and Statistics, Assam	2001,2011
		Proportion of main workers in total workers	Population census of India	2001,2011
		Proportion of non-Scheduled Tribes and Scheduled Castes Population	Population census of India	2001,2011
		Female Literacy	Population census of India	2001,2011
		Electrification Status	Chief General Manager, Rural Electrification, APDCL	2001,2011
	Food Utilisation	Access to Safe drinking Water	Population census of India	2001,2011
		Sanitation facilities	Population census of India	2001,2011
	Stability	Accessibility to Permanent houses for living	Population census of India	2001,2011

4.2.2 Status of Food Security in Assam: Analysis and Discussion

Based on the methodology elaborated in the previous section we have analyzed the status of food security by constructing food security index. First of all we illustrate food security index 2001 followed by that for the year 2011.

(a)Food Security Status: 2001

The analysis of food security status in Assam related to year 2001 is undertaken in this subsection. For this we start with the food availability index.

(i)Food Availability Index

This sort of analysis would enable us in understanding the status of food availability enjoyed by the people in the state of Assam during 2001. The detailed food availability status is elaborated in Table 4.13. From the computed food availability index, 2001 it follows that Central Brahmaputra valley attains highest position with a composite score of 0.70 driven by high values of Per-capita value of Agricultural Production, Per-hectare consumption of fertilizer and proportion of non-forest area. It is followed by lower Brahmaputra valley because of very low performance in road connectivity. North Bank Plain got third position with a composite score of 0.59. Upper Brahmaputra Valley stood at fourth position with a composite score of 0.55. Barak Valley stood at fifth position with a dismal score of 0.3 depressed by dismal performances in respect of per-capita value of agricultural production, irrigation extent and road connectivity. Almost these factors are responsible for lagging behind the score of Hill region which stood last with a score of 0.29.

Table: 4.13
Food Availability Index: 2001

Agro-Climatic Zone	*Per Capita Value of Agricultural Production*[1]			*Irrigation Extent*[2]			*Use of Fertilizer*[2]			*Proportion of Forests*[2]			*Road Connectivity*[3]			Availability Index
	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	
Lower Brahmaputra Valley	1392	3	0.88	20	4	0.2	83	1	0.91	78	2	0.78	112	5	0.09	0.69
North Bank Plain	1242	4	0.71	22	3	0.22	59	3	0.61	81	1	0.81	151	2	0.18	0.59
Upper Brahmaputra Valley	1473	1	0.97	10	5	0.1	43	4	0.41	70	4	0.7	150	3	0.17	0.55
Central Brahmaputra Valley	1418	2	0.91	29	2	0.29	74	2	0.8	81	1	0.81	118	4	0.11	0.7
Hill Region	672	6	0.08	30	1	0.3	14	6	0.05	72	3	0.72	507	1	0.99	0.29
Barak Valley	809	5	0.23	6	6	0.06	33	5	0.29	60	5	0.6	76	6	0.01	0.3

Source: 1. Directorate of Agriculture, Govt. of Assam
2. Directorate of Economics and Statistics, Govt. of Assam
3.PopulationCensus,2001

(ii)Food Accessibility Index

This sort of analysis would enable us in understanding the status of food accessibility enjoyed by the people in the state of Assam during 2001. The detailed food accessibility status is elaborated in Table 4.14.

From the computed food accessibility index, 2001 it follows that Barak Valley attains highest position with a composite score of 0.71 driven by high proportions of non SC and ST population, main workers in total workers. It is followed by lower Brahmaputra valley with a composite score of 0.70. Central Brahmaputra Valley got third position with a composite score of 0.68. Upper Brahmaputra Valley stood at fourth position with a composite score of 0.67. North Bank plain stood at fifth position with a score of 0.63. The score of Hill region is 0.45 which make it stood at last.

(iii)Food Utilization Index

This sort of analysis would enable us in understanding the status of food utilization enjoyed by the people in the state of Assam during 2001. The detailed food utilization status is elaborated in Table 4.15.

From the computed food utilisation index, 2001 it follows that Upper Brahmaputra Valley attains highest position with a composite score of 0.69 driven by higher proportions of populations having access to safe drinking water. It is followed by Central Brahmaputra Valley with a composite score of 0.68. Barak Valley got third position with a composite score of 0.56. Lower Brahmaputra Valley stood at fourth position with a composite score of 0.54. North Bank plain stood at fifth position with a score of 0.44 and finally hill region stood at sixth position with a score of 0.43.

Table: 4.14
Food Accessibility Index: 2001

Agro-Climatic Zone	*Percentage of population above Poverty line*[1]			*Proportion of main workers in total workers*[2]			*Proportion of non-Scheduled Tribes and Scheduled Castes Population*[2]			*Female Literacy*[2]			*Electrification Status*[3]			Food Accessibility
	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	
Lower Brahmaputra Valley	72	1	0.72	73	4	0.73	77	5	0.77	50	6	0.5	37	2	0.37	0.70
North Bank Plain	65	2	0.65	68	6	0.68	78	4	0.78	52	5	0.52	24	5	0.24	0.63
Upper Brahmaputra Valley	43	6	0.43	71	5	0.71	85	2	0.85	61	1	0.61	30	3	0.3	0.67
Central Brahmaputra Valley	60	4	0.6	77	2	0.77	82	3	0.82	54	3	0.54	28	4	0.28	0.68
Hill Region	59	5	0..59	75	3	0.75	37	6	0.37	53	4	0.53	24	6	0.24	0.45
Barak Valley	61	3	0.61	78	1	0.78	86	1	0.86	55	2	0.55	39	1	0.39	0.71

Source: 1. Directorate of Economics and Statistics, Govt. of Assam
2. Population Census, 2001
3. Chief General Manager, Rural Electrification, APDCL

Table: 4.15
Food Utilisation Index: 2001

Agro-Climatic Zone	*Access to Safe drinking Water*			*Sanitation facilities*			Food Utilisation Index Value
	Value	Rank	Index Value	Value	Rank	Index Value	
Lower Brahmaputra Valley	58	3	0.58	49	4	0.49	**0.54**
North Bank Plain	50	5	0.5	37	6	0.37	**0.44**
Upper Brahmaputra Valley	76	2	0.76	62	1	0.62	**0.69**
Central Brahmaputra Valley	79	1	0.79	58	3	0.58	**0.68**
Hill Region	47	6	0.47	39	5	0.39	**0.43**
Barak Valley	51	4	0.51	61	2	0.61	**0.56**

Source: Population Census, 2001

(iv)Stability Dimension

This sort of analysis would enable us in understanding the status of stability dimension of food security in the state of Assam during 2001. The detailed stability dimension is elaborated in Table 4.16.

Table: 4.16
Stability Index: 2001

Agro-Climatic Zone	The percentage of population having permanent houses		
	Value	Rank	Index Value
Lower Brahmaputra Valley	23	6	**0.23**
North Bank Plain	25	5	**0.25**
Upper Brahmaputra Valley	35	2	**0.35**
Central Brahmaputra Valley	45	1	**0.45**
Hill Region	34	3	**0.34**
Barak Valley	26	4	**0.26**

Source: Population Census, 2001

From the computed stability index, 2001 it follows that Central Brahmaputra Valley attains highest position with a composite score of 0.45. It is followed by upper

Brahmaputra valley with a composite score of 0.35. Hill region got third position with a composite score of 0.34. Barak Valley stood at fourth position with a composite score of 0.26. North Bank plain stood at fifth position with a score of 0.25. The score of Lower Brahmaputra Valley is 0.23 which make it stood at last.

(v)Food Security Status

This sort of analysis would enable us in understanding the status of food security in the state of Assam during 2001. The detailed food security index is elaborated in Table 4.17.

Table: 4.17
Food Security Index: 2001

Agro-Climatic Zone	*Food Security Index*	Rank
Lower Brahmaputra Valley	0.54	3
North Bank Plain	0.48	4
Upper Brahmaputra Valley	0.56	2
Central Brahmaputra Valley	0.63	1
Hill Region	0.38	6
Barak Valley	0.46	5

Source: Compiled from Table 4.13 - 4.16

From the computed food security index, 2001 it follows that Central Brahmaputra Valley attains highest position with a composite score of 0.63 driven by higher attainments in food availability and food utilization indices. It is followed by upper Brahmaputra valley with a composite score of 0.56. Lower Brahmaputra Valley got third position with a composite score of 0.54. North Bank plain stood at fourth position with a composite score of 0.48. Barak valley stood at fifth position with a score of 0.46. The score of Hill region is 0.38 which make it stood at last because of its dismal performances in the food availability and stability dimensions. Now if we categorize the range of index (0.00 - 1.00) into five equidistant parts such as very low (0.00-0.20), low (0.20-0.40), medium (0.40-0.60), high (0.60-0.80) and very high (0.80-1.00) and try to compare them with the values attained by the agro-climatic zones, we find that only Central Brahmaputra valley has attained high levels of food

security, four zones namely Upper Brahmaputra valley, Lower Brahmaputra Valley, North Bank plain, and Barak valley has attained medium levels of food security, and finally Hill region has fallen to low food security category.

(b)Food Security Status: 2011

The analysis of food security status in Assam related to year 2011 is undertaken in this subsection. For this we start with the food availability index.

(i)Food Availability Index

This sort of analysis would enable us in understanding the status of food availability enjoyed by the people in the state of Assam during 2011. The detailed food availability status is elaborated in Table 4.18.

From the computed food availability index, 2011 it follows that Central Brahmaputra valley attains highest position with a composite score of 0.61 driven by high values of Per-capita value of Agricultural Production, Per-hectare consumption of fertilizer and proportion of non-forest area. It is followed by lower Brahmaputra valley with a composite score of 0.60 because of very low performance in road connectivity. North Bank Plain got third position with a composite score of 0.55. Upper Brahmaputra Valley stood at fourth position with a composite score of 0.51. Hill region stood at fifth position with a score of 0.43 depressed by dismal performances in respect of per-capita value of agricultural production, and use of fertilizer. Almost these factors are responsible for lagging behind the score of Barak Valley which stood last with a score of 0.25 (Table 4.18).

(ii)Food Accessibility Index

This sort of analysis would enable us in understanding the status of food accessibility enjoyed by the people in the state of Assam during 2011. The detailed food accessibility status is elaborated in Table 4.19.

From the computed food accessibility index, 2011 it follows that Central Brahmaputra Valley attains highest position with a composite score of 0.83 driven by high proportions of non SC and ST population, main workers in total workers. It is followed by Barak valley with a composite score of 0.77. Upper Brahmaputra Valley got third position with a composite score of 0.75. Lower Brahmaputra Valley stood at fourth position with a composite score of 0.74. North Bank plain stood at fifth position with a score of 0.72. The score of Hill region is 0.63 which make it stood at last (Table 4.19).

(iii)Food Utilization Index

This sort of analysis would enable us in understanding the status of food utilization enjoyed by the people in the state of Assam during 2011. The detailed food utilization status is elaborated in Table 4.20.

From the computed food utilisation index, 2011 it follows that Upper Brahmaputra Valley attains highest position with a composite score of 0.79 driven by higher proportions of populations having access to safe drinking water. It is followed by Central Brahmaputra Valley with a composite score of 0.78. Barak Valley got third position with a composite score of 0.75. Lower Brahmaputra Valley stood at fourth position with a composite score of 0.69. North Bank plain stood at fifth position with a score of 0.68 and finally hill region stood at sixth position with a score of 0.62 (Table 4.20).

(iv)Stability Dimension

This sort of analysis would enable us in understanding the status of stability dimension of food security in the state of Assam during 2011. The detailed stability dimension is elaborated in Table 4.21.

Table: 4.18
Food Availability Index: 2011

Agro-Climatic Zone	***Per Capita Value of Agricultural Production***			***Irrigation Extent***			***Use of Fertilizer***			***Proportion of Non-Forests***			***Road Connectivity***			Availability Index
	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	
Lower Brahmaputra Valley	1498	4	0.73	24	4	0.24	75	2	0.75	75	4	0.75	135	4	0.12	**0.60**
North Bank Plain	1541	3	0.78	27	3	0.27	72	3	0.72	83	2	0.83	139	3	0.13	**0.55**
Upper Brahmaputra Valley	1733	1	0.98	13	5	0.13	52	4	0.46	79	3	0.79	187	2	0.19	**0.51**
Central Brahmaputra Valley	1564	2	0.8	36	2	0.36	91	1	0.95	85	1	0.85	115	5	0.09	**0.61**
Hill Region	824	6	0.02	45	1	0.45	17	6	0.03	72	5	0.72	662	1	0.94	**0.43**
Barak Valley	1004	5	0.21	9	6	0.09	38	5	0.29	62	6	0.62	72	6	0.02	**0.25**

Source: 1. Directorate of Agriculture, Govt. of Assam
2. Directorate of Economics and Statistics, Govt. of Assam
3.PopulationCensus,2011

Table: 4.19
Food Accessibility Index: 2011

Agro-Climatic Zone	***Percentage of population above Poverty line***			***Proportion of main workers in total workers***			***Proportion of non-Scheduled Tribes and Scheduled Castes Population***			***Female Literacy***			***Electrification Status***			Accessibility Index
	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	Value	Rank	Index Value	
Lower Brahmaputra Valley	71	3	0.71	73	4	0.73	74	5	0.74	64	6	0.64	87	2	0.87	**0.74**
North Bank Plain	67	4	0.67	69	6	0.69	80	4	0.8	66	5	0.66	82	5	0.82	**0.72**
Upper Brahmaputra Valley	65	5	0.65	70	5	0.7	81	3	0.81	71	2	0.71	88	1	0.88	**0.75**
Central Brahmaputra Valley	82	1	0..82	79	1	0.79	87	1	0.87	86	1	0.86	83	4	0.83	**0.83**
Hill Region	64	6	0.64	74	3	0.74	40	6	0.4	67	4	0.67	68	6	0.68	**0.63**
Barak Valley	72	2	0.72	76	2	0.76	83	2	0.83	70	3	0.70	84	3	0.84	**0.77**

Source: 1. Directorate of Economics and Statistics, Govt. of Assam
2. Population Census, 2011
3. Chief General Manager, Rural Electrification, APDCL

Table: 4.20
Food Utilisation Index: 2011

AGRO-CLIMATIC ZONE	***Access to Safe drinking Water***			***Sanitation facilities***			**Food Utilisation Index Value**
	Value	Rank	Index Value	Value	Rank	Index Value	
Lower Brahmaputra Valley	84	3	0.84	54	5	0.54	0.69
North Bank Plain	82	4	0.82	53	6	0.53	0.68
Upper Brahmaputra Valley	85	2	0.85	73	2	0.73	0.79
Central Brahmaputra Valley	87	1	0.87	68	3	0.68	0.78
Hill Region	62	6	0.62	62	4	0.62	0.62
Barak Valley	66	5	0.66	83	1	0.83	0.75

Source: Population Census, 2011

Table: 4.21
Stability Index: 2011

Agro-Climatic Zone	The Percentage of Population Having Permanent Houses		
	Value	Rank	Index Value
Lower Brahmaputra Valley	30	5	0.30
North Bank Plain	36	2	0.36
Upper Brahmaputra Valley	31	4	0.31
Central Brahmaputra Valley	39	1	0.39
Hill Region	29	6	0.29
Barak Valley	32	3	0.32

Source: Population Census, 2011

From the computed stability index, 2011 it follows that Central Brahmaputra Valley attains highest position with a composite score of 0.39. It is followed by North bank plain with a composite score of 0.36. Barak Valley got third position with a composite score of 0.32. Upper Brahmaputra Valley stood at fourth position with a composite score of 0.31. Lower Brahmaputra Valley stood at fifth position with a score of 0.30. The score of Hill region is 0.29 which make it to stand at last.

(v)Food Security Status

This sort of analysis would enable us in understanding the status of food security in the state of Assam during 2011. The detailed food security index is elaborated in Table 4.22.

Table: 4.22
Food Security Index: 2011

Agro-Climatic Zone	**Food Security Index**	Rank
Lower Brahmaputra Valley	0.58	3
North Bank Plain	0.57	4
Upper Brahmaputra Valley	0.59	2
Central Brahmaputra Valley	0.65	1
Hill Region	0.49	6
Barak Valley	0.52	5

Source: Authors Calculation based Table 4.18-4.21

From the computed food security index, 2011 it follows that Central Brahmaputra Valley attains highest position with a composite score of 0.65 driven by higher attainments in food accessibility and food utilization indices. It is followed by Upper Brahmaputra valley with a composite score of 0.59. Lower Brahmaputra Valley got third position with a composite score of 0.58. North Bank plain stood at fourth position with a composite score of 0.57. Barak valley stood at fifth position with a score of 0.52. The score of Hill region is 0.49 which make it to stand at last because of its dismal performance in the stability dimension. Now if we categorize the range of index (0.00 - 1.00) into five equidistant parts[1] and try to compare them with the values attained by the agro-climatic zones, we find that only Central Brahmaputra valley has attained high levels of food security, five zones namely Upper Brahmaputra valley, North Bank plain, Barak valley, lower Brahmaputra valley and Hill region has attained medium levels of food security.

[1] very low (0.00-0.20), low (0.20-0.40), medium (0.40-0.60), high (0.60-0.80) and very high (0.80-1.00)

(c) Food Security Status: 2001-2011

This sort of analysis would enable us in understanding the pattern of food security in the state of Assam during the period 2001 to 2011. The detailed comparison of food security indices is elaborated in Table 4.23.

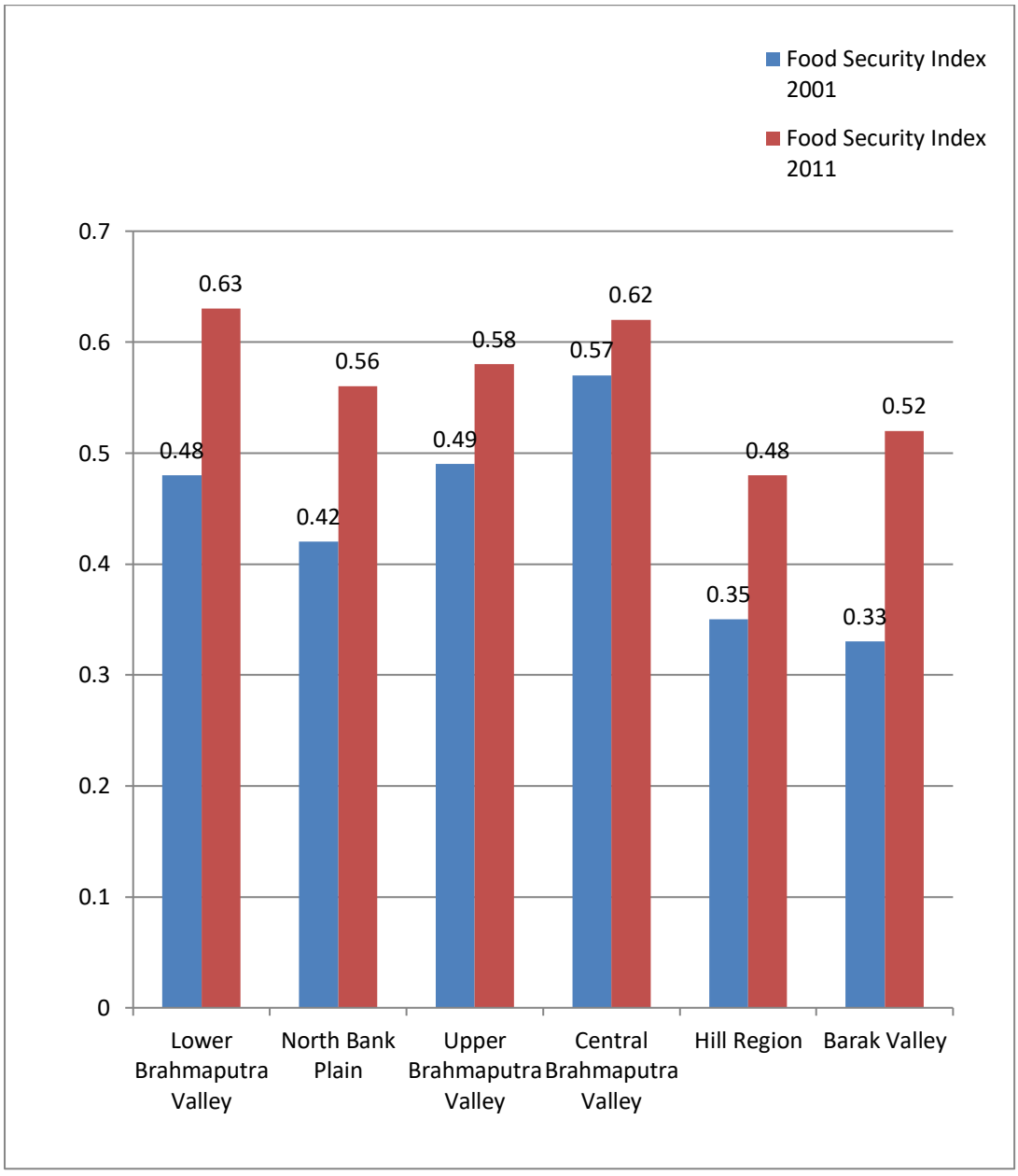
Table: 4.23
Comparing Food Security Indices: 2001 & 2011(Based on Secondary data)

Agro-Climatic Zone	Food Security Index		Difference (2001-2011)
	2001	2011	
Lower Brahmaputra Valley	0.54	0.58	+0.04
North Bank Plain	0.48	0.57	+0.09
Upper Brahmaputra Valley	0.56	0.59	+0.03
Central Brahmaputra Valley	0.63	0.65	+0.02
Hill Region	0.38	0.49	+0.11
Barak Valley	0.46	0.52	+0.06

Source: Authors Calculation based on Tables 4.17 & 4.22

Comparison between food security index of 2001 and 2011 reveals that Hill region emerges as top gainer followed by North bank plain and Barak valley. Central Brahmaputra valley, lower Brahmaputra valley and upper Brahmaputra valley could marginally improve their respective positions. This is illustrated in the chart 4.2.

Diagram: 4.2
Comparison of Food Security Indices: 2001 & 2011



Source: Table 4.23

4.3 Household Food Security in Assam: Field Survey, 2014-15

Until now we have been analyzing food security based on secondary data from macro perspective. But this kind of analysis does not throw light on household level situation. To unveil this angle we have been resorted to primary survey of households across various regions (agro climatic zones) in Assam. On the basis of primary data an attempt has been made to measure the food security status of rural households.

4.3.1 Household Food Security in Assam: The Analytical Framework

To analyze the food security status of households, the study constructs food security index using the primary data collected from the randomly selected households. This involves three steps: identification, aggregation and categorization. Identification is related to indentifying various indicators for gauging information about various dimensions of food security. Aggregation on the other hand is concerned with deriving food security statistics for the households. Finally, categorization of households is being made across various levels of food security.

Household food security is a complex phenomenon. It is mainly the interaction of four aspects of food availability, food access and food utilization and stability which results in a situation of food security. Food availability, food access and food utilization and stability dimensions are not separate phenomena they overlap.

For estimating the food availability in a household we use the per capita calorie availability of a household as proxy variable. Firstly, the nutrient content of both produced and purchased food items is calculated in terms of kcal. We have used 7 days recall period in attaining information about the produced and purchased food items of the household. The value of the total calorie available to the household is divided by the adjusted household size to arrive at per capita calorie availability of a household.

Per Capita Calorie Availability of a Household = CA/AHS.....(4.1)

Where, CAI = Calorie Availability in the ith Household;

AHS = Adjusted Household Size of the ith Household.

Then, an index is constructed following the Max-Min Approach. Under this approach, firstly minimum and maximum values (goalposts) are chosen. Then we use the formula as under:

Food availability index = (CA_i -MNPCA) ÷ (MXPCA - MNPCA).....(4.2)

Where, CA_i = Calorie Availability in the ith Household

MXPCA = Maximum value of per capita calorie availability.

MNPCA = Minimum value of per capita calorie availability.

But, food availability by itself does not ensure adequate access to food: though adequate food availability is necessary for food access. So, for assessing the condition of food access in a household we construct a food accessibility index. For this we use the following framework.

Firstly, we construct the household specific food price impact index for each household. We shall use Fisher's Ideal Index Number Formula for calculating food price index given by

$$\text{Food Price Impact Index} = \sqrt{\frac{\sum PnQo}{\sum PoQo} \times \frac{\sum PnQn}{\sum PoQn}} \times 100 \quad \text{…….(4.3)}$$

Po = Price of the jth food item consumed by the ith household in the base period.

Pn = Price of the jth food item consumed by the ith household in the current period.

Qo= Quantity of the jth food item consumed by the ith household in the base period.

Qn= Quantity of the jth food item consumed by the ith household in the current period

Secondly, we construct the household specific income index given by

$$\text{Income Index} = \frac{\text{HAIt}}{\text{HAIt}-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.4)$$

Where HAI_t = Aggregate annual income of the household during the survey year

HAI_{t-1} = Aggregate annual income of the household during the year preceding to the survey year

Based on the two indices we arrive at the food accessibility index

FAI = 0; if Food Price Impact Index < Income Index

1; if Food Price Impact Index >= Income Index

The food accessibility index takes value 1 to indicate highest degree of accessibility, while it takes the value 0 to point out lowest degree of accessibility.

Given a certain basic level of food acquirement, a household's food security level would depend on how well this food was utilized. The utilization of food at household level is a function of food storage, food preparation, food sharing pattern followed in the household. It is also dependent on health status and accessibility status in respect of drinking water facilities. Differences in these respect yields different levels of food security given the same level of acquirement. Thus, for assessing the level of food utilization in a household, we have considered five indicators. The justification of the indicators is outlined below:

1. The facilities of the household for food storage: Proper food storage helps to preserve the quality and nutritional value of the foods one purchase, and also helps in preventing spoilage. Additionally, proper food storage can help prevent food borne illnesses caused by harmful bacteria. So the facilities that the household have for food storage becomes important for better food utilization.

2. Households practices in relation to food preparation: Food is a prime factor of life so it is very important to prepare and manage food in well. Better practices of food preparation leads to improved level of food utilization.

3. Pattern of food sharing within the household: Food sharing has been defined as the un resisted transfer of food from one food motivated individual to another. Proper food sharing in the household, a situation when both non-adult and adult members of the household are getting proportionately equal share of food, leads to higher levels of food utilization.

4. The state of health of the members of the household: Health is a state of complete physical, mental and social well being, and not merely the absence of disease or infirmity. A good health condition of the members of the household will definitely reflect better levels of food utilization in the household.

5. The state of accessibility to safe drinking water of the household: Polluted and contaminated water undermines the safety and the nutritional well being of individuals. Studies have shown that water has a significant contribution in the food utilization level of a household.

The household's level of attainment in all these regards is captured through some scores assigned for each level of achievement for each sub-indicator and these scores are then added to arrive at a composite score. This composite score is finally transformed to get the food utilization index value following the Max-Min Approch.

The last dimension addresses the stability of the other three dimensions over time. People cannot be considered food secure until they feel so and they do not feel food secure until there is stability in respect of availability, accessibility and proper utilization of food. One of the variables that can be used as a proxy variable for capturing the stability dimension of food security is the standard of living of the people/ household. Standard of living refers to the material basis of well being. For measuring the standard of living of the household we have used the methodology used by National Family Health Surveys in India which firstly gathers information about

the ownership pattern of household goods by assigning scores for level of attainment for each variable. The variables with the assigned scores are illustrated below:

***1. House type*:** 4 for *pucca*, 2 for semi-*pucca*, 0 for *kachha*;
***2. Toilet facility*:** 4 for own flush toilet, 2 for public or shared flush toilet or own pit toilet, 1 for shared or public pit toilet, 0 for no facility;

***3. Source of lighting*:** 2 for electricity, 1 for kerosene, gas, or oil, 0 for other source of lighting;

***4. Main fuel for cooking*:** 2 for electricity, liquid petroleum gas, or biogas, 1 for coal/coke/lignite, charcoal, or kerosene, 0 for other fuel;

***5. Source of drinking water*:** 2 for pipe, hand pump, or well in residence/yard/plot, 1 for public tap, hand pump, or well, 0 for other water source;

***6. Separate room for cooking*:** 1 for yes, 0 for no;

***7. Ownership of house*:** 2 for yes, 0 for no;

***8.Ownership of agricultural land*:** 4 for 5 acres or more, 3 for 2.0.4.9 acres, 2 for less than 2 acres or acreage not known, 0 for no agricultural land;

***9. Ownership of irrigated land*:** 2 if household owns at least some irrigated land, 0 for no irrigated land;

***10. Ownership of livestock*:** 2 if owns livestock, 0 if does not own livestock;

***11.Ownership of durable goods*:** 4 each for a car or tractor, 3 each for a moped/scooter/motorcycle, telephone, refrigerator, or colour television, 2 each for a bicycle, electric fan, radio/transistor, sewing machine, black and white television, water pump, bullock cart, or thresher, and 1 each for a mattress, pressure cooker, chair, cot/bed, table, or clock/watch.

The scores are then aggregated to arrive at composite score. This composite score is finally transformed to get the stability index value following the Max-Min Approch.

Finally, the simple average of all four values of indices is calculated which gives us household food security index (HFSI)

$$HFSI = \frac{HFAVI+HFACI+HFUI+SI}{4} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4.5)$$

Where HFSI= Household level Food Security Index

HFAVI= Household level Food Availability Index

HFACI= Household level Food Accessibility Index

HFUI= Household level Food Utilization Index

SI= Stability Index

For the purpose of this study, a household is defined as a group of people living together and eating from the same pot. The values so derived are categorized in the following manner.

Table: 4.24
Categorisation of the Level of Food Security

FSI	Level of Food Security
0 ≤ FSI ≤ .20	Very Low
.21 ≤ FSI ≤ .40	Low
.41 ≤ FSI ≤ .60	Medium
.61 ≤ FSI ≤ .80	High
.81 ≤ FSI ≤ 1	Very High

Source: Developed by the Author

To determine the household level food security status we have computed the number of household (per thousand) falling into the I^{th} category of food security. It is simply the division of households falling in the category I divided by total households multiplied by thousand. In other words,

Number of Household (per thousand) falling into the I^{th} category of food security =

$$\frac{\text{Number of Households Falling in the Ith Category of Food Security}}{\text{Number of Total Households}} \times 1000 \ldots\ldots\ldots\ldots(4.6)$$

Similar procedure is followed for calculation of Number of household (per thousand) falling into the I^{th} category of food availability, accessibility, utilization and stability status.

4.3.2 Household Food Security Status: 2014-15

The analysis of household food security status in Assam related to year 2014-15 is undertaken in this subsection. For this we start with the food availability index.

(i)Food Availability Index

This sort of analysis would enable us in understanding the status of food availability at the household level in the state of Assam. The detailed food availability status is elaborated in Table 4.25.

Table: 4.25
Food Availability Status of the Households: 2014-15

Agro-Climatic Zones	District	Very Low	Low	Medium	High	Very High
Lower Brahmaputra Valley	Kamrup Metro	606	285	96	7	6
North Bank Plain	Lakhimpur	614	307	68	11	0
Upper Brahmaputra Valley	Dibrugarh	723	248	29	0	0
Central Brahmaputra Valley	Nagaon	619	352	19	10	0
Hill Region	Dima Hassao	480	340	140	40	0
Barak Valley	Cachar	32	269	323	280	96
Assam		530	296	106	51	17

Source: Primary Survey, 2014-15

In Table 4.25 food availability status is analyzed with the help of primary data with respect to different agro-climatic zones. In the Lower Brahmaputra Valley, 606 households have very low level of food availability status, 285 households have low level of food availability status, 96 households have medium level of food availability status, 7 households have high level of food availability status and 6 households have very high level of food availability status.

In the North Bank Plain, 614 households have very low level of food availability status, 307 households have low level of food availability status, 68 households have medium level of food availability status, and 11 households have high level of food availability status. In the Upper Brahmaputra Valley, 723 households have very low level of food availability status, 248 households have low level of food availability status, and 29 households have medium level of food availability status.

In the Central Brahmaputra Valley, 619 households have very low level of food availability status, 352 households have low level of food availability status, 19 households have medium level of food availability status, and 10 households have high level of food availability status. In the Hill Region, 480 households have very low level of food availability status, 340 households have low level of food availability status, 140 households have medium level of food availability status, and 40 households have high level of food availability status.

In Barak Valley, 32 households have very low level of food availability status, 269 households have low level of food availability status, 323 households have medium level of food availability status, 280 households have high level of food availability status and 96 households have very high level of food availability status. In Assam, 530 households have very low level of food availability status, 296 households have low level of food availability status, 106 households have medium level of food availability status, 51 households have high level of food availability status and 17 households have very high level of food availability status.

(ii)Food Accessibility Index

This sort of analysis would enable us in understanding the status of food accessibility at the household level in the state of Assam during 2014-15. The detailed food accessibility status is elaborated in Table 4.26.

Table: 4.26
Food Accessibility Status of the Households: 2014-15

Agro-Climatic Zones	District	Very Low	Low	Medium	High	Very High
Lower Brahmaputra Valley	Kamrup Metro	24	612	73	224	67
North Bank Plain	Lakhimpur	11	523	136	239	91
Upper Brahmaputra Valley	Dibrugarh	0	446	149	238	167
Central Brahmaputra Valley	Nagaon	0	610	124	229	37
Hill Region	Dima Hassao	100	540	140	220	0
Barak Valley	Cachar	31	473	204	247	45
Assam		22	543	130	233	72

Source: Primary Survey, 2014-15

From Table 4.26, in the Lower Brahmaputra Valley, 24 households have very low level of food accessibility status, 612 households have low level of food accessibility status, 73 households have medium level of food accessibility status, 224 households have high level of food accessibility status and 67 households have very high level of food accessibility status.

In the North Bank Plain, 11 households have very low level of food accessibility status, 523 households have low level of food accessibility status, 136 households have medium level of food accessibility status, and 239 households have high level of food accessibility status. In the Upper Brahmaputra Valley, 446 households have low level of food accessibility status, and 149 households have medium level of food accessibility status, 238 households have high level of food accessibility status and 167 households have very high level of food accessibility status.

In the Central Brahmaputra Valley, 610 households have low level of food accessibility status, 124 households have medium level of food accessibility status, and 229 households have high level of food accessibility status. In the Hill Region, 100 households have very low level of food accessibility status, 540 households have

low level of food accessibility status, 140 households have medium level of food accessibility status, and 220 households have high level of food accessibility status.

In Barak Valley, 31 households have very low level of food accessibility status, 473 households have low level of food accessibility status, 204 households have medium level of food accessibility status, 247 households have high level of food accessibility status and 45 households have very high level of food accessibility status. In Assam, 22 households have very low level of food accessibility status, 543 households have low level of food accessibility status, 130 households have medium level of food accessibility status, 233 households have high level of food accessibility status and 72 households have very high level of food accessibility status.

(iii)Food Utilization Index

This sort of analysis would enable us in understanding the status of food utilization at the household level in the state of Assam during 2014-15. The detailed food utilization status is elaborated in Table 4.27. From the Table 4.27, in the Lower Brahmaputra Valley, 6 households have very low level of food utilization status, 55 households have low level of food utilization status, 194 households have medium level of food utilization status, 219 households have high level of food utilization status and 455 households have very high level of food utilization status.

Table: 4.27
Food Utilization Status of the Households: 2014-15

Agro-Climatic Zones	District	Very Low	Low	Medium	High	Very High
Lower Brahmaputra Valley	Kamrup Metro	6	55	194	219	455
North Bank Plain	Lakhimpur	0	91	205	216	488
Upper Brahmaputra Valley	Dibrugarh	60	168	208	248	316
Central Brahmaputra Valley	Nagaon	19	19	238	181	543
Hill Region	Dima Hassao	0	20	160	340	480
Barak Valley	Cachar	10	54	151	225	560
Assam		17	70	196	248	469

Source: Primary Survey, 2014-15

In the North Bank Plain, 11 households have very low level of food utilization status, 91 households have low level of food utilization status, 205 households have medium level of food utilization status, 216 households have high level of food utilization status, and 488 households have very high level of food utilization status. In the Upper Brahmaputra Valley, 60 households have very low level of food utilization status, 160 households have low level of food utilization status, and 208 households have medium level of food utilization status, 248 households have high level of food utilization status and 316 households have very high level of food utilization status.

In the Central Brahmaputra Valley, 19 households have very low level of food utilization status, 19 households have low level of food utilization status, 238 households have medium level of food utilization status, and 181 households have high level of food utilization status, 543 households have very high level of food utilization status,. In the Hill Region, 20 households have low level of food utilization status, 160 households have medium level of food utilization status, and 340 households have high level of food utilization status and 480 households have very high level of food utilization status.

In Barak Valley, 10 households have very low level of food utilization status, 54 households have low level of food utilization status, 151 households have medium level of food utilization status, 225 households have high level of food utilization status and 560 households have very high level of food utilization status. In Assam, 17 households have very low level of food utilization status, 70 households have low level of food utilization status, 196 households have medium level of food utilization status, 248 households have high level of food utilization status and 469 households have very high level of food utilization status (Table 4.27).

(iv)Stability Dimension

This sort of analysis would enable us in understanding the status of stability dimension of food security at the household level in the state of Assam during 2014-15. The detailed stability dimension is elaborated in Table 4.28. From Table 4.28, in the Lower Brahmaputra Valley, 182 households have very low level of stability dimension status, 345 households have low level of stability dimension status,

339households have medium level of stability dimension status, 115 households have high level of stability dimension status and 19 households have very high level of stability dimension status.

In the North Bank Plain, 216 households have very low level of stability dimension status, 318 households have low level of stability dimension status, 341 households have medium level of stability dimension status, 102 households have high level of stability dimension status, and 23 households have very high level of stability dimension status. In the Upper Brahmaputra Valley, 327 households have very low level of stability dimension status, 297 households have low level of stability dimension status, and 346 households have medium level of stability dimension status, 19 households have high level of stability dimension status and 11 households have very high level of stability dimension status.

Table: 4.28
Stability Status of the Households: 2014-15

Agro-Climatic Zones	District	Very Low	Low	Medium	High	Very High
Lower Brahmaputra Valley	Kamrup Metro	182	345	339	115	19
North Bank Plain	Lakhimpur	216	318	341	102	23
Upper Brahmaputra Valley	Dibrugarh	327	297	346	19	11
Central Brahmaputra Valley	Nagaon	162	352	419	57	10
Hill Region	Dima Hassao	100	300	340	180	80
Barak Valley	Cachar	118	430	301	15	8
Assam		191	344	349	19	24

Source: Primary Survey, 2014-15

In the Central Brahmaputra Valley, 162 households have very low level of stability dimension status, 352 households have low level of stability dimension status, 419 households have medium level of stability dimension status, and 57 households have high level of stability dimension status, 10 households have very high level of stability dimension status,. In the Hill Region, 100 households have very low level of

stability dimension status, 300 households have low level of stability dimension status, 340 households have medium level of stability dimension status, and 180 households have high level of stability dimension status and 80 households have very high level of stability dimension status.

In Barak Valley, 118 households have very low level of stability dimension status, 430 households have low level of stability dimension status, 301 households have medium level of stability dimension status, 15 households have high level of stability dimension status and 8 households have very high level of stability dimension status. In Assam, 191 households have very low level of stability dimension status, 344 households have low level of stability dimension status, 349 households have medium level of stability dimension status, 19 households have high level of stability dimension status and 24 households have very high level of stability dimension status (Table 4.28).

(v)Food Security Status

This sort of analysis would enable us in understanding the status of food security at the household level in the state of Assam during 2014-15. The detailed food security index is elaborated in Table 4.29. From Table 4.29, in the Lower Brahmaputra Valley, 7 households have very low level of food security, 262 households have low level of food security, 153 households have medium level of food security, 486 households have high level of food security and 92 households have very high level of food security.

In the North Bank Plain, 238 households have low level of food security, 182 households have medium level of food security, 466 households have high level of food security and 114 households have very high level of food security. In the Upper Brahmaputra Valley, 20 households have very low level of food security, 426 households have low level of food security, 99 households have medium level of food security, 416 households have high level of food security and 39 households have very high level of food security.

Table: 4.29
Food Security Status of the Households: 2014-15

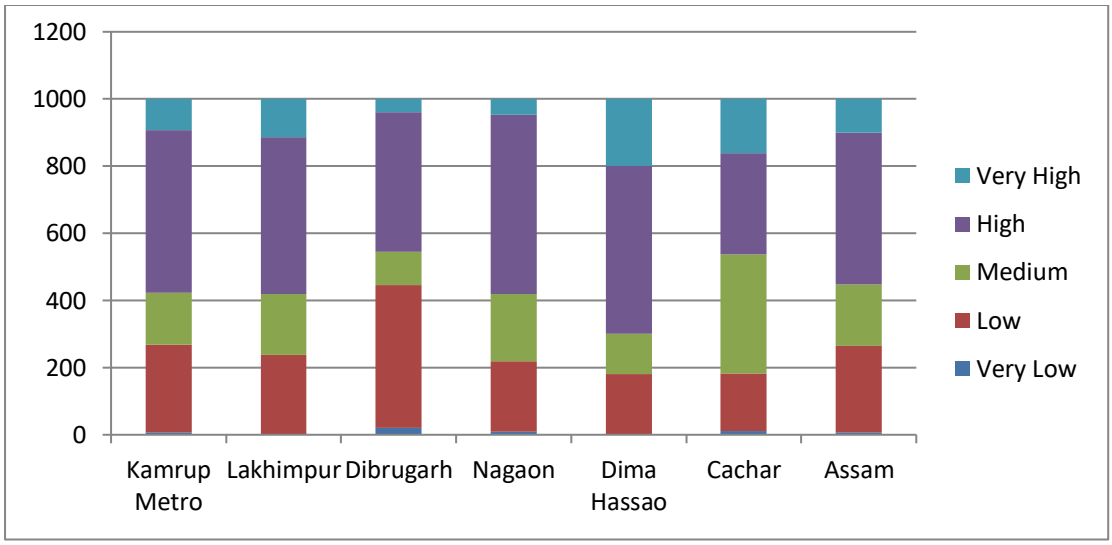
Agro-Climatic Zones	District	Very Low	Low	Medium	High	Very High
Lower Brahmaputra Valley	Kamrup Metro	7	262	153	486	92
North Bank Plain	Lakhimpur	0	238	182	466	114
Upper Brahmaputra Valley	Dibrugarh	20	426	99	416	39
Central Brahmaputra Valley	Nagaon	10	209	200	533	48
Hill Region	Dima Hassao	0	180	120	500	200
Barak Valley	Cachar	11	172	355	301	161
Assam		8	256	184	452	100

Source: Primary Survey, 2014-15

In the Central Brahmaputra Valley, 10 households have very low level of food security, 209households have low level of food security, 200 households have medium level of food security, 533 households have high level of food security and 48 households have very high level of food security. In the Hill Region, 180 households have low level of food security, 120 households have medium level of food security, 500 households have high level of food security and 200 households have very high level of food security.

In Barak Valley, 11 households have very low level of food security, 172 households have low level of food security, 355 households have medium level of food security, 301 households have high level of food security and 161 households have very high level of food security. In Assam, 8 households have very low level of stability dimension status, 256 households have low level of stability dimension status, 184 households have medium level of stability dimension status, 452 households have high level of stability dimension status and 100 households have very high level of stability dimension status.

Diagram: 4.3
Food Security in Assam (Per Thousand): 2014-15



Source: Primary Survey, 2014-15

4.4 Dynamisms around the concept of Food Security

There are several inherent dynamisms around the concept of Food Security. To understand various dynamics of food security we have analyzed the relationship between non-farm Sector and various economic and non economic variables.

4.4.1 Food Security Status and Non-Economic Variables

To capture various aspects of food security we have analyzed the relationship between food security and various non-economic variables such as primary occupation, religion, household size, type of houses, educational level, social group and gender.

(a) Food Security Status and Primary Occupation

The relationship between food security status and Primary occupation of the household is analyzed in the Table 4.30. It is seen that among the legislators, senior officials and managers 30 percent enjoyed high levels of food security status, while approximately 60 percent enjoyed very high levels of food security. Also among professionals 70 percent have high levels of food security. Among technicians and

associate professionals 83 percent have high food security and 13 percent have very high levels of food security.

Table: 4.30
Primary Occupation of the Household and Food Security Status of the Household

Primary Occupation of the Household	Food Security Status of the Household					Total
	Very Low (0.0-0.20)	Low (0.20-0.40)	Medium (0.40-0.60)	High (0.60-0.80)	Very High (0.80-1.00)	
Legislators, Senior officials and Managers	0 (0.0) [0.0]	0 (0.0) [0.0]	3 (12.5) [2.7]	7 (29.2) [2.6]	14 (58.3) [23.3]	24 (100.0) [4.0]
Professionals	0 (0.0) [0.0]	2 (5.3) [1.3]	2 (5.3) [1.8]	27 (71.1) [9.9]	7 (18.4) [11.7]	38 (100.0) [6.3]
Technicians and Associate Professionals	0 (0.0) [0.0]	1 (1.1) [0.6]	3 (3.4) [2.7]	72 (82.8) [26.5]	11 (12.6) [18.3]	87 (100.0) [14.5]
Clerks	1 (1.7) [20.0]	13 (21.7) [8.4]	16 (26.7) [14.4]	26 (43.3) [9.6]	4 (6.7) [6.7]	60 (100.0) [10.0]
Service workers and Shop & market sales workers	1 (2.7) [20.0]	16 (43.2) [10.4]	8 (21.6) [7.2]	12 (32.4) [4.4]	0 (0.0) [0.0]	37 (100.0) [6.1]
Skilled agricultural and fishery workers	2 (1.3) [40.0]	75 (48.4) [48.7]	33 (21.3) [29.7]	42 (27.1) [15.4]	3 (1.9) [5.0]	155 (100.0) [25.7]
Craft and related trades workers	1 (0.7) [20.0]	34 (22.5) [22.1]	30 (19.9) [27.0]	68 (45.0) [25.0]	18 (11.9) [30.0]	151 (100.0) [25.1]
Plant and machine operators and assemblers	0 (0.0) [0.0]	1 (5.6) [0.6]	6 (33.3) [5.4]	8 (44.4) [2.9]	3 (16.7) [5.0]	18 (100.0) [3.0]
Elementary Occupation	0 (0.0) [0.0]	12 (46.2) [7.8]	9 (34.6) [8.1]	5 (19.2) [1.8]	0 (0.0) [0.0]	26 (100.0) [4.3]
Others]	0 (0.0) [0.0]	0 (0.0) [0.0]	1 (16.7) [0.9]	5 (83.3) [1.8]	0 (0.0) [0.0]	6 (100.0) [1.0]
Total	5 (0.8) [100.0]	154 (25.6) [100.0]	111 (18.4) [100.0]	272 (45.2) [100.0]	60 (10.0) [100.0]	602 (100.0) [100.0]

Source: Primary Survey, 2014-15
Note: figures in the parenthesis represent the percentage of row total respectively

Among the clerks 21 percent have low levels of food security status, 26 percent have medium levels of food security while 44 percent have high levels of food

security. Among the service workers and shop and market sales workers 43 percent have low levels of food security, 22 percent have medium levels of food security, 32 percent have high levels of food security.

Among the skilled agricultural and fishery workers, 48 percent have low levels of food security, 21 percent have medium, 27 percent have high levels of food security. Among the craft and trade workers 23 percent have low levels of food security, 20 percent have medium levels of food security and 45 percent and 20 percent have high and very high levels of food security. Among elementary occupation 46 percent have low levels of food security.

Moreover, among the households falling under the category of very low levels of food security 40 percent are skilled agricultural and fishery workers, 20 percent are craft and related trade workers. Also, the households falling under the category of low levels of food security 48 percent are skilled agricultural and fishery workers, 22 percent are craft and related trade workers, 10 percent are service workers and shop and market sales workers, and 8 percent have elementary occupation holders. Households enjoying Medium levels of food security can be seen among skilled agricultural and fishery workers (30 percent), and craft and related trade workers (27 percent). Generally majority of households enjoying high to very high levels of food security have occupations such as legislators, professionals and associate professionals (40 percent and 52 percent respectively (Table 4.30).

(b)Food Security Status and Type of Houses

The relationship between food security status and types of house is analyzed in Table 4.31. It is seen from the table that households having very low food security status generally reside in katcha houses (75 percent) and rest in semi pucca houses. Among household having low levels of food security, 41 percent have katcha houses and 57 percent have semi pucca houses. Among household having medium levels of food security, 96 percent have have semi-pucca houses. In the high food security category, 79 percent have pucca houses and 21 percent have semi pucca houses. While in the very high food security category, all have pucca houses.

Table: 4.31
Type of Houses and Food Security Status of the Household

		Type of Houses			Total
		Katcha House	Semi Pucca houses	Pucca Houses	
Food Security Status	Very Low (0.0-0.20)	56 (74.67)	19 (25.33)	0 (0.00)	75 (100.00)
	Low (0.20-0.40)	35 (41.67)	48 (57.14)	1 (1.19)	84 (100.00)
	Medium (0.40-0.60)	2 (1.80)	106 (95.50)	3 (2.7)	111 (100.00)
	High (0.60-0.80)	1 (0.37)	56 (20.59)	215 (79.04)	272 (100.00)
	Very High (0.80-1.00)	0 (0.00)	0 (0.00)	60 (100.00)	60 (100.00)
Total		94 (15.61)	229 (38.03)	279 (46.36)	602 (100.00)

Source: Primary Survey, 2014-15
Note: figures in the parenthesis represent the percentage of row total respectively

(c)Food Security Status and Household Size

The relationship between food security status and Household size is analyzed in Table 4.32. It is seen from the table that households having very low food security status generally have small families (80 percent) and rest are large families. Among household having low levels of food security, 55 percent have small family size and 43 percent have medium size families. Among household having medium levels of food security, 30 percent have small family size and 62 percent have medium size families. In the high food security category, 27 percent have small family size and 63 percent have medium size families and 10 percent have large family size. While in the very high food security category, 13percent have small family size and 62 percent have medium size families and 25 percent have large family size.

Table: 4.32
Food Security Status of the Household and Household Size

Food Security Status of the Household	Household Size			Total
	Small (1-3)	Medium (4-6)	Large (7&above)	
Very Low(0.0-0.20)	4 (80.00)	0 (0.00)	1 (20.00)	5 (100.00)
Low(0.20-0.40)	84 (54.55)	66 (42.85)	4 (2.60)	154 (100.00)
Medium(0.40-0.60)	33 (29.72)	69 (62.16)	9 (8.12)	111 (100.00)
High(0.60-0.80)	72 (26.47)	171 (62.87)	29 (10.66)	272 (100.00)
Very High(0.80-1.00)	8 (13.33)	37 (61.67)	15 (25.00)	60 (100.00)
Total	201 (33.39)	343 (56.98)	58 (9.63)	602 (100.00)

Source: Primary Survey, 2014-15
Note: Figures in the parenthesis represent the percentage of row total respectively.

(d)Food Security Status and Social Group

The relationship between food security status and social group of the household is analyzed in Table 4.33. From the table it is seen that, among the General category people 36 percent enjoyed high levels of food security, while approximately 8 percent enjoyed very high levels of food security. Also among scheduled caste people 40 percent have high levels of food security and 32 percent have medium levels of food security. Among scheduled tribe people 16 percent have low levels of food security, 10 percent have medium levels of food security, 54 percent have high levels of food security and 19 percent have very high levels of food security.

Among other backward class people 28 percent have low levels of food security, 18 percent have medium levels of food security, 46 percent have high levels of food security and 6 percent have very high levels of food security. Moreover, among the households falling under the category of very low levels of food security 80 percent belong to the other backward class, 20 percent belong to scheduled caste. Also, the households falling under the category of low levels of food security 72 percent belong to the other backward class. Households enjoying Medium levels of food security can be seen among other backward class people (61percent). Generally majority of

households enjoying high to very high levels of food security belong to the other backward class people (65 percent and 40 percent respectively) (Table 4.33).

Table: 4.33
Food Security Status and Social Group of the Household

		Social group of the Household				Total
		General	Scheduled Caste	Scheduled Tribe	Other Backward Class	
Food Security Status of the Household	Very Low (0.0-0.20)	0 (0.0) [0.0]	1 (20.0) [2.6]	0 (0.0) [0.0]	4 (80.0) [1.0]	5 (100.0) [0.8]
	Low (0.20-0.40)	23 (14.9) [23.0]	7 (4.5) [18.4]	13 (8.4) [16.5]	111 (72.1) [28.8]	154 (100.0) [25.6]
	Medium (0.40-0.60)	23 (20.7) [23.0]	12 (10.8) [31.6]	8 (7.2) [10.1]	68 (61.3) [17.7]	111 (100.0) [18.4]
	High (0.60-0.80)	36 (13.2) [36.0]	15 (5.5) [39.5]	43 (15.8) [54.4]	178 (65.4) [46.2]	272 (100.0) [45.2]
	Very High (0.80-1.00)	18 (30.0) [8.0]	3 (5.0) [7.9]	15 (25.0) [19.0]	24 (40.0) [6.2]	60 (100.0) [10.0]
Total		100 (16.6) [100.0]	38 (6.3) [100.0]	79 (13.1) [100.0]	385 (64.0) [100.0]	602 (100.0) [100.0]

Source: Primary Survey, 2014-15
Note: Figures in parenthesis () and [] represent the percentages of row and column total respectively.

(e)Food Security Status and Religion

The relationship between food security status and Religion of the household is analyzed in Table 4.34. It is seen that among the Hindu households 46 percent enjoyed high levels of food security, while approximately 9 percent enjoyed very high levels of food security, 17 percent enjoyed medium levels of food security, while approximately 26 percent enjoyed low levels of food security. Among the Muslim households 29 percent enjoyed high levels of food security, while approximately 18 percent enjoyed very high levels of food security, 32 percent enjoyed medium levels of food security, while approximately 19 percent enjoyed low levels of food security. Among the Christian households 53 percent enjoyed high levels of food security, while approximately 40 percent enjoyed very high levels of food security and 6 percent enjoyed medium levels of food security.

Moreover, among the households falling under the category of very low levels of food security all are Hindus. Also, the households falling under the category of low levels of food security 95 percent are Hindus, 4 percent are Muslims. Households enjoying Medium levels of food security can be seen among Hindus (88 percent), Muslims (10 percent). Generally majority of households enjoying high to very high levels of food security are Hindus (93 and 78 percent respectively).

(f)Food Security Status and Gender

The relationship between food security status and Gender of the household is analyzed in Table 4.35. It is seen from the table that majority of households having very low food security status generally are male headed households (80 percent) and rest is female headed. Among household having low levels of food security, 77 percent are male headed households where 23 percent households are female headed households. Among household having medium levels of food security, 79 percent are male headed households where 21 percent households are female headed households. In the high food security category, 78 percent are male headed households where 22 percent households are female headed households. While in the very high food security category, 92 percent are male headed households.

Table: 4.34

Food Security Status and Religion of the Household

Food Security Status of the Household	Religion of the Household			Total
	Hindu	Muslim	Christian	
Very Low (0.0-0.20)	5 (100.0) [0.9]	0 (0.0) [0.0]	0 (0.0) [0.0]	5 (100.0) [0.8]
Low (0.20-0.40)	147 (95.5) [26.7]	7 (4.5) [18.9]	0 (0.0) [0.0]	154 (100.0) [25.6]
Medium (0.40-0.60)	98 (88.3) [17.8]	12 (10.8) [32.4]	1 (0.9) [6.7]	111 (100.0) [18.4]
High (0.60-0.80)	253 (93.0) [46.0]	11 (4.0) [29.7]	8 (2.9) [53.3]	272 (100.0) [45.2]
Very High (0.80-1.00)	47 (78.3) [8.5]	7 (11.7) [18.9]	6 (10.0) [40.0]	60 (100.0) [10.0]
Total	550 (91.4) [100.0]	37 (6.1) [100.0]	15 (2.5) [100.0]	602 (100.0) [100.0]

Source: Primary Survey, 2014-15

Note: Figures in parenthesis () and [] represent the percentages of row and column total respectively.

Table: 4.35
Food Security Status and Sex of the Head of the Household

		Sex of the Head of the Household		Total
		Female	Male	
Food Security Status	Very Low(0.0-0.20)	1 (20.00)	4 (80.00)	5 (100.00)
	Low(0.20-0.40)	35 (22.73)	119 (77.27)	154 (100.00)
	Medium(0.40-0.60)	23 (20.72)	88 (79.28)	111 (100.00)
	High(0.60-0.80)	58 (21.32)	214 (78.68)	272 (100.00)
	Very High(0.80-1.00)	5 (8.33)	55 (91.67)	60(100.00)
Total		122 (20.27)	480 (79.73)	602 (100.00)

Source: Primary Survey, 2014-15
Note: Figures in parenthesis () and [] represent the percentages of row and column total respectively.

(g)Food Security Status and Education

The relationship between food security status and educational level of the household is analyzed in Table 4.36. It is seen that the households where head of the household is illiterate, Majority (42 percent) suffered from the low levels of food security. Also among the households where head of the household is having education up to secondary level, 10 percent have very high levels of food security, 30 percent have high levels of food security and 32 percent have medium levels of food security. Among the households where head of the household is having education up to higher secondary level, 47 percent have high to very high levels of food security.

Among the households where head of the household is having education up to graduate and above level, 16 percent have very high levels of food security, 55 percent have high levels of food security and 15 percent have medium levels of food security. Moreover, among the households falling under the category of very low levels of food security 80 percent household head have education below higher

secondary level, 20 percent are illiterate. Also, the households falling under the category of low levels of food security 4 percent household head are illiterate, 15 percent have education below secondary level, 61 percent have education below higher secondary level, and 20 percent have education up to graduate and higher levels. The households falling under the category of medium levels of food security 4 percent household head are illiterate, 23 percent have education below secondary level, 46 percent have education below higher secondary level, and 28 percent have education up to graduate and higher levels(Table 4.36).

Table: 4.36
Food Security Status of the Household and Educational Level of the Head of the Household

Food Security Status of the Household	Educational Level of the Head of the Household					Total
	Illiterate	Secondary	Higher Secondary	Graduate and above	Others	
Very Low (0.0-0.20)	1 (20.0) [7.1]	0 (0.0) [0.0]	4 (80.0) [1.4]	0 (0.0) [0.0]	0 (0.0) [0.0]	5 (100.0) [0.8]
Low (0.20-0.40)	6 (3.9) [42.9]	24 (15.6) [28.9]	94 (61.0) [32.5]	30 (19.5) [14.1]	0 (0.0) [0.0]	154 (100.0) [25.6]
Medium (0.40-0.60)	4 (3.6) [28.6]	25 (22.5) [30.1]	51 (45.9) [17.6]	31 (27.9) [14.6]	0 (0.0) [0.0]	111 (100.0) [18.4]
High (0.60-0.80)	3 (1.1) [21.4]	25 (9.2) [30.1]	126 (46.3) [43.6]	117 (43.0) [54.9]	1 (0.4) [33.3]	272 (100.0) [45.2]
Very High (0.80-1.00)	0 (0.0) [0.0]	9 (15.0) [10.8]	14 (23.3) [4.8]	35 (58.3) [16.4]	2 (3.3) [66.7]	60 (100.0) [10.0]
Total	14 (2.3) [100.0]	83 (13.8) [100.0]	289 (48.0) [100.0]	213 (35.4) [100.0]	3 (0.5) [100.0]	602 (100.0) [100.0]

Source: Primary Survey, 2014-15
Note: Figures in parenthesis () and [] represent the percentages of row and column total respectively.

4.4.2 Food Security Status and Economic Variables

To capture various aspects of food security we have analyzed the relationship between food security and various economic variables such as income, asset and land using the data collected through field survey.

(a) Food Security Status and Land

The relationship between the food security status of the household and landholding possessed by a household is analyzed in Table 4.37. It is seen that in case of landless households 18 percent suffered from the low levels of food security, 51 percent enjoyed high levels of food security, and 13 percent enjoyed very high levels of food security. In case of Marginal landowning households 50 percent suffered from the low levels of food security, 50 percent enjoyed high levels of food security. In case of Small landowning households 46 percent suffered from the low levels of food security, 19 percent enjoyed the medium levels of food security, and 27 percent enjoyed high levels of food security. In case of medium landowning households 48 percent suffered from the low levels of food security, 21 percent enjoyed the medium levels of food security, and 30 percent enjoyed high levels of food security. In case of large landowning households 50 percent enjoyed the medium levels of food security, and rest 50 percent enjoyed high levels of food security (Table 4.37).

Moreover, among the households falling under the category of very low levels of food security 60 percent are landless households, 20 percent are small landholding households and rest 20 percent are medium landholding households. Also, the households falling under the category of low levels of food security 47 percent are landless households, 24 percent are small landholding households, and 27 percent are medium landholding households. The households falling under the category of medium levels of food security 64 percent are landless households, 13 percent are small landholding households, 16 percent are medium landholding households, and 6 percent are large landowning households. The households falling under the category of high levels of food security 79 percent are landless households, 8 percent are small landholding households, and 10 percent are medium landholding households. The

households falling under the category of very high levels of food security 91 percent are landless households and 9 percent are small landholding households.

Table: 4.37
Food Security Status and Landholding Possessed by the Household: 2014-15

		Landholding Possessed by the Household					Total
		Landless	Marginal (1.25-2.5 acre)	Small (2.5-5 acre)	Medium (5-10 acre)	Large (10 acre &above)	
Food Security Status of the Household	Very Low (0.0-0.20)	3 (60.0) [0.7]	0 (0.0) [0.0]	1 (20.0) [1.2]	1 (20.0) [1.1]	0 (0.0) [0.0]	5 (100.0) [0.8]
	Low (0.20-0.40)	73 (47.4) [17.5]	2 (1.3) [50.0]	37 (24.0) [46.2]	42 (27.3) [48.3]	0 (0.0) [0.0]	154 (100.0) [25.6]
	Medium (0.40-0.60)	71 (64.0) [17.0]	0 (0.0) [0.0]	15 (13.5) [18.8]	18 (16.2) [20.7]	7 (6.3) [50.0]	111 (100.0) [18.4]
	High (0.60-0.80)	215 (79.0) [51.6]	2 (0.7) [50.0]	22 (8.1) [27.5]	26 (9.6) [29.9]	7 (2.6) [50.0]	272 (100.0) [45.2]
	Very High (0.80-1.00)	55 (91.7) [13.2]	0 (0.0) [0.0]	5 (8.3) [6.2]	0 (0.0) [0.0]	0 (0.0) [0.0]	60 (100.0) [10.0]
Total		417 (69.3) [100.0]	4 (0.7) [100.0]	80 (13.3) [100.0]	87 (14.5) [100.0]	14 (2.3) [100.0]	602 (100.0) [100.0]
Contingency Coefficient		0.352					

Source: Primary Survey,2014-15
Note: Figures in parenthesis () and [] represent the percentages of row and column total respectively.

Also the Pearson Chi square test between the grouping of rural households in Assam according to food security status and land holding pattern suggest that there is association between the two types of grouping. In other words with the increase in landholding size possessed by the household the food security status of the household also gets enhanced moderately. However, to measure the strength of association contingency coefficient is calculated. It reveals that association is not so strong.

(b) Food Security Status and Income

The relationship between the food security status of the household and per capita monthly income of the household is analyzed in Table 4.38. It is seen that in case of household having very low per capita monthly income 4 percent suffered from the very low levels of food security, 93 percent suffered from the low levels of food security, and rest 3 percent enjoyed medium levels of food security. In case of household having low per capita monthly income 23 percent suffered from the low levels of food security, 51 percent suffered from the very low levels of food security, and rest 26 percent enjoyed medium levels of food security.

In case of household having medium per capita monthly income 81 percent enjoyed high levels of food security and 17 percent enjoyed very high levels of food security. In case of household having high per capita monthly income 92 percent enjoyed very high levels of food security. In case of household having very high per capita monthly income, all enjoyed very high levels of food security.

Moreover, among the households falling under the category of very low levels of food security all have very low levels of per capita monthly income. Also, the households falling under the category of low levels of food security 68 percent have very low levels of per capita monthly income, and 31 percent have low levels of per capita monthly income. The households falling under the category of medium levels of food security 96 percent have low levels of per capita monthly income, and 2 percent have medium levels of per capita monthly income.

The households falling under the category of high levels of food security 21 percent have low levels of per capita monthly income, and 79 percent have medium levels of per capita monthly income. The households falling under the category of very high levels of food security 77 percent have medium levels of per capita monthly income, and 20 percent have high levels of per capita monthly income.

Also the Pearson Chi square test between the grouping of rural households in Assam according to food security status and monthly income of the households suggest that there is association between the two types of grouping. However, to measure the

strength of association contingency coefficient is calculated. It reveals that association is strong. So it can be inferred that with the increase in monthly income of the family the household food security status also gets accelerated.

Referring to table 4.14, it gets clear that grouping the households of rural areas of Assam according to high and low profession or according to high and low incomes is more realistic classification than the classification according to land size as far as the status of food security (low or high) is concerned. The traditional theoretical belief that land ownership determines the livelihood and food security status is not very clearly applicable to Assam.

Table: 4.38
Food Security Status and Per Capita Monthly Income of the Household: 2014-15

		Per capita Monthly Income of the Household (in rupees)					Total
		Very Low	Low	Medium	High	Very High	
Food Security Status of the Household	Very Low (0.0-0.20)	5 (100.0) [4.4]	0 (0.0) [0.0]	0 (0.0) [0.0]	0 (0.0) [0.0]	0 (0.0) [0.0]	5 (100.0) [0.8]
	Low (0.20-0.40)	105 (68.2) [92.9]	48 (31.2) [22.9]	1 (0.6) [0.4]	0 (0.0) [0.0]	0 (0.0) [0.0]	154 (100.0) [25.6]
	Medium (0.40-0.60)	2 (1.8) [1.8]	106 (95.5) [50.5]	2 (1.8) [0.8]	1 (0.9) [7.7]	0 (0.0) [0.0]	111 (100.0) [18.4]
	High (0.60-0.80)	1 (0.4) [0.9]	56 (20.6) [26.7]	215 (79.0) [81.4]	0 (0.0) [0.0]	0 (0.0) [0.0]	272 (100.0) [45.2]
	Very High (0.80-1.00)	0 (0.0) [0.0]	0 (0.0) [0.0]	46 (76.7) [17.4]	12 (20.0) [92.3]	2 (3.3) [100.0]	60 (100.0) [10.0]
Total		113 (18.8) [100.0]	210 (34.9) [100.0]	264 (43.9) [100.0]	13 (2.2) [100.0]	2 (0.3) [100.0]	602 (100.0) [100.0]
Contingency Coefficient		0.750					

Source: Primary Survey, 2014-15
Note: Figures in parenthesis () and [] represent the percentages of row and column total respectively.

(c) Food Security Status and Asset Ownership

The relationship between the food security status of the household and Asset Ownership Pattern of the household is analyzed in Table 4.39. It is seen that in case of household having very low asset ownership pattern 4 percent suffered from the very low levels of food security, 91 percent suffered from the low levels of food security, and 4 percent enjoyed medium levels of food security. In case of household having low asset ownership pattern 23 percent suffered from the low levels of food security, 50 percent enjoyed medium levels of food security, and 26 percent enjoyed high levels of food security. In case of household having medium asset ownership pattern 92 percent enjoyed high levels of food security and 27 percent enjoyed very high levels of food security. In case of household having high per capita monthly income 43 percent enjoyed high levels of food security, and 54 percent enjoyed very high levels of food security. In case of household having very high asset ownership pattern, 94 percent enjoyed very high levels of food security.

Moreover, among the households falling under the category of very low levels of food security all have very low asset ownership pattern. Also, the households falling under the category of low levels of food security 68 percent have very low asset ownership pattern, and 31 percent have asset ownership pattern. The households falling under the category of medium levels of food security 94 percent have low asset ownership pattern, and 1 percent have medium asset ownership pattern. The households falling under the category of high levels of food security 20 percent have low asset ownership pattern, and 71 percent have medium asset ownership pattern. The households falling under the category of very high levels of food security 27 percent have medium asset ownership pattern, 48 percent have high asset ownership pattern, and 25 percent have high asset ownership pattern.

Also the Pearson Chi square test between the grouping of rural households in Assam according to food security status and asset ownership pattern of the households suggest that there is association between the two types of grouping. However, to measure the strength of association contingency coefficient is calculated. It reveals

that association is strong. So it can be inferred that with the increase in the asset ownership pattern of the family the household's food security status also gets accelerated.

Table: 4.39
Food Security Status and Asset Ownership Pattern of the Household: 2014-15

		Asset Ownership Pattern of the Household					Total
		Very Low (0.0-0.20)	Low (0.20-0.40)	Medium (0.40-0.60)	High (0.60-0.80)	Very High (0.80-1.00)	
Food Security Status of the Household	Very Low (0.0-0.20)	5 (100.0) [4.3]	0 (0.0) [0.0]	0 (0.0) [0.0]	0 (0.0) [0.0]	0 (0.0) [0.0]	5 (100.0) [0.8]
	Low (0.20-0.40)	105 (68.2) [91.3]	48 (31.2) [23.2]	0 (0.0) [0.0]	1 (0.6) [1.9]	0 (0.0) [0.0]	154 (100.0) [25.6]
	Medium (0.40-0.60)	4 (3.6) [3.5]	104 (93.7) [50.2]	1 (0.9) [0.5]	1 (0.9) [1.9]	1 (0.9) [6.2]	111 (100.0) [18.4]
	High (0.60-0.80)	1 (0.4) [0.9]	55 (20.2) [26.6]	193 (71.0) [91.9]	23 (8.5) [42.6]	0 (0.0) [0.0]	272 (100.0) [45.2]
	Very High (0.80-1.00)	0 (0.0) [0.0]	0 (0.0) [0.0]	16 (26.7) [7.6]	29 (48.3) [53.7]	15 (25.0) [93.8]	60 (100.0) [10.0]
Total		115 (19.1) [100.0]	207 (34.4) [100.0]	210 (34.9) [100.0]	54 (9.0) [100.0]	16 (2.7) [100.0]	602 (100.0) [100.0]
Contingency Coefficient		0.771					

Source: Primary Survey, 2014-15
Note: Figures in parenthesis () and [] represent the percentages of row and column total respectively.

Testing of Hypothesis: Based on the analysis carried out in the chapter, it can be concluded that although the food security status on aggregate is improving across regions in Assam but still it is not upto the satisfactory level also there is large scale variations within regions. The above analysis provides enough evidence to accept the null hypothesis and conclude that food security status of the households in Assam is not satisfactory.

Remarks

The study analyses the food security status in Assam from both macro and micro perspectives in order to address the ***Objective Number 1***. At the macro level food security status is analyzed with respect to agro-climatic zones based on aggregate secondary data collected from various sources. There are a number of indicators that influence the food security in one way or the other. We have combined these indicators into a set of four broad food security indices. These are food availability, food accessibility, food utilization and lastly the stability. The results show that

1. No agro-climatic zone is able to attain high levels of food security in 2001.

2. Only the Central Brahmaputra valley is able to attain a moderately higher food security level compared to other zones in 2001.

3. But in 2011, two regions namely Lower Brahmaputra valley and Central Brahmaputra valley is able to attain a high food security level.

4. Comparison between food security index of 2001 and 2011 reveals that although the food security status in all agro-climatic zones has marginally improved over the years, but noticeable improvements has been made by Barak Valley and Lower Brahmaputra Valley.

Moreover, the analysis above does not talk about the food security status at the household level; hence the Food security status is analyzed with the help of primary data relating to different agro-climatic zones collected during 2014-15. The analysis of primary data has yields a somewhat different result from that of secondary data. The results points out that

1. On aggregate the food security status at the household level is not satisfactory.

2. In lower Brahmaputra valley almost 60 percent of the household enjoy high levels of food security

3. While in North bank plain merely 38 percent and in Barak Valley almost 42 percent households enjoy high levels of food security.

It can be concluded that although the food security status on aggregate is improving across regions in Assam during the study period, but still it is not upto the satisfactory level. Moreover, there are large scale variations within regions.