

CHAPTER FIVE

RESULTS AND DISCUSSIONS

This chapter incorporates the results by analyzing the objectives and validating the research questions set for the present study.

Section 5.1 provides the results of the first objective based on the analysis of the secondary data. It analyses the inter-state status of food security in rural India and the status of rural Assam in relation to the rest of the rural India for two cross sections viz. 2001-05 and 2007-11. It incorporates the extent of inter-state disparity in the level of food security in rural India on the basis of some statistical measures.

Section 5.2 depicts the results of the second objective based on the analysis of secondary data. It provides findings on the intra-state status of food security in rural Assam for two cross sections viz. 2001-05 and 2007-11. It incorporates the results related to the extent of inter-district disparity in the level of food security and the degree of association between various dimensions of food security in rural Assam.

Section 5.3 shows the results of the third objective based on the analysis of secondary data. It provides the findings regarding the role of PDS on the attainment of food security in rural Assam by analyzing the secondary data on per capita purchase of food grains and diversion of food grains.

Section 5.4 represents the results of the fourth objective based on the analysis of primary data collected during the field survey. It incorporates the results related to the status and determinants of household level food security in rural Assam. It also

highlights the nature and strength of the association between various dimensions of food security at household level.

5.1 Analysis on First Objective:

This section incorporates the results of the first objective based on the analysis of the relevant secondary data.

Table 5.1 Ranks of the States in Rural India on Dimensional Indices and on Food Security Index (FSI), 2001-05

States	Food Availability Index	Rank	Food Accessibility Index	Rank	Food Absorption Index	Rank	FSI	Rank
Andhra Pradesh	0.523	6	0.372	11	0.426	10	0.440	8
Assam	0.326	16	0.472	4	0.306	16	0.368	13
Bihar	0.507	9	0.312	15	0.452	6	0.424	11
Chhattisgarh	0.348	15	0.307	17	0.362	12	0.339	16
Gujrat	0.543	5	0.415	6	0.448	9	0.468	6
Haryana	0.843	2	0.489	3	0.459	3	0.597	2
Jharkhand	0.273	17	0.317	14	0.223	17	0.271	17
Karnataka	0.476	11	0.389	9	0.453	5	0.439	9
Kerala	0.446	12	0.678	1	0.45	8	0.524	3
Madhya Pradesh	0.408	13	0.31	16	0.35	14	0.356	14
Maharashtra	0.487	10	0.392	8	0.415	11	0.431	10
Orissa	0.382	14	0.334	13	0.332	15	0.349	15
Punjab	0.963	1	0.493	2	0.504	1	0.653	1
Rajasthan	0.508	8	0.359	12	0.36	13	0.409	12
Tamil Nadu	0.568	4	0.438	5	0.467	2	0.491	4
Uttar Pradesh	0.637	3	0.384	10	0.451	7	0.490	5
West Bengal	0.519	7	0.404	7	0.454	4	0.459	7
All India Figure	0.515		0.403		0.406		0.441	

Source: Calculated by the Researcher

Table 5.1 shows that Punjab is the most food secured state with a FSI value of 0.653 whereas Jharkhand is the least food secured state with a FSI value of 0.271 in rural India during the cross section 2001-05. Comparative high FSI value of Punjab reflects the good performance of the state on all the indicators of food security while the story is quite opposite for Jharkhand in this regard. This is evident from the data of various dimensional indicators of the states. Punjab tops the list in all the dimensions of food security, except in food accessibility where Kerala ranks first. Jharkhand is placed at the bottom with regard to food availability and food absorption while Chhattisgarh ranks last in respect of food accessibility. The ranking of states on the status of food security in ascending order as follows: Punjab, Haryana, Kerala, Tamil Nadu, Uttar Pradesh, Gujrat, West Bengal, Andhra Pradesh, Karnataka, Maharashtra, Bihar, Rajasthan, Assam, Madhya Pradesh, Orissa, Chhattisgarh and Jharkhand.

So far as the relative status of Assam is concerned, overall it is found very miserable. The comparison with all India figure from the Table 5.1 represents that Assam is far below than national average in respect of the attainment of food security. Apart from the food accessibility dimension, the performance of Assam in the other two dimensions of food security is found below the national average. The miserable status of Assam is reflected from the ranking of the states given in Table 5.1 which shows that Assam has achieved 13th rank out of the 17 major states with regard to the level of food security. This has mainly happened due to the relatively poor performance of Assam in respect of food availability and food absorption dimension in contrast to the food accessibility dimension. This is evident from Table 5.1 which shows that Assam possess lower ranks in case of Food Availability Index and Food Absorption Index, viz. 16th and 15th respectively, while its rank in respect of Food Accessibility Index is much

higher, viz. 4th. This shows that Assam needs to strengthen the performance in availability and absorption dimensions of food security in order to catch up with the other well performing states in respect of food security.

Table 5.2 Distribution of States with regard to the level of Food Security for 2001-05

Very Low	Low	Moderate	High	Very High
Nil	Assam, Madhya Pradesh, Orissa, Chhattisgarh and Jharkhand	Haryana, Kerala, Tamil Nadu, Uttar Pradesh, Gujrat, West Bengal, Andhra Pradesh, Karnataka, Maharashtra, Bihar and Rajasthan	Punjab	Nil

Source: Researchers own classification

It is observed from Table 5.2 that only a mere 5.88 per cent of the states have achieved high level of food security in rural India during the period 2001-05. About 29.41 percent of the states have achieved low level of food security while 64.71 percent of the states are found to be moderately food secure. Thus, on the basis of the analysis of the present study, rural India, on the average, can be called a moderately food secure country.

Table 5.3 Descriptive Statistics of FSI and Various Dimensional Indices of Rural India, for 2001-05

Statistical Measures	Food Availability Index	Food Accessibility Index	Food Absorption Index	FSI
Range	0.690	0.371	0.281	0.382
Mean	0.515	0.403	0.406	0.441
Standard Deviation	0.169	0.090	0.707	0.092

Source: Calculated by the Researcher

The values of range for different indices indicate that the gap between two extreme states in respect of food availability is quite large while it is relatively low in case of

other two dimensions and in the overall level of food security. Thus inequality between two extreme states in rural India is found relatively high in case of food availability. FSI with a mean value of 0.441 exerts that the national level food security of rural India on the average is a moderate one. The comparison of mean FSI value in Table 5.3 with individual FSI values of the states from Table 5.1 shows that the level of food security achieved by Punjab, Haryana, Kerala, Tamil Nadu, Uttar Pradesh, Gujrat and West Bengal is higher than the national average while it is below national average in case of the other states. The values of standard deviation indicate the inter-state disparities in the level of food security and in different dimensions of food security in rural India. The inter-state disparity is found relatively higher in case of food absorption and food availability.

Table 5.4 Ranks of the States on Dimensional Indices and on Food Security Index (FSI), 2007-11

States	Food Availability Index	Rank	Food Accessibility Index	Rank	Food Absorption Index	Rank	FSI	Rank
Andhra Pradesh	0.571	5	0.530	7	0.482	1	0.528	3
Assam	0.365	16	0.574	4	0.184	16	0.374	13
Bihar	0.486	10	0.419	14	0.245	6	0.383	12
Chhattisgarh	0.428	14	0.388	17	0.225	11	0.347	16
Gujrat	0.566	6	0.516	11	0.241	7	0.4410	7
Haryana	0.851	2	0.639	2	0.250	3	0.580	2
Jharkhand	0.321	17	0.418	16	0.153	17	0.297	17
Karnataka	0.504	9	0.535	6	0.239	8	0.426	10
Kerala	0.436	13	0.775	1	0.282	2	0.498	4
Madhya Pradesh	0.453	12	0.419	15	0.201	14	0.357	14
Maharashtra	0.485	11	0.526	8	0.219	12	0.410	11
Orissa	0.405	15	0.449	13	0.194	15	0.349	15
Punjab	0.948	1	0.623	3	0.228	10	0.610	1
Rajasthan	0.565	7	0.517	10	0.204	13	0.429	9
Tamil Nadu	0.610	4	0.562	5	0.250	4	0.474	5
Uttar Pradesh	0.662	3	0.476	12	0.246	5	0.462	6
West Bengal	0.564	8	0.523	9	0.236	9	0.4409	8
All India Figure	0.542		0.523		0.240		0.435	

Source: Calculated by the Researcher

Table 5.4 shows that Punjab is the most food secured state with a FSI value of 0.610 whereas Jharkhand is the least food secured state with a FSI value of 0.297 in rural India for the cross section 2007-11. Similar thing has also happened in 2001-05 only with a slight difference of FSI values. Thus the ranking of the states so far as first and last positions are concerned, has remained unchanged in both the periods i.e. in 2001-05 and 2007-11. A somewhat high FSI value of Punjab reflects the good performance of the state on all the indicators of food security while the story is quite opposite for Jharkhand in this regard. This is evident from the data of various dimensional indicators of the states. So far as dimensional indices of food security are concerned, Punjab tops the list in case of food availability while Kerala ranks first with regard to food accessibility and Andhra Pradesh comes first with respect to food absorption. Jharkhand is placed at the bottom with regard to food availability and food absorption while Chhattisgarh ranks last in respect of food accessibility. The ranking of states on the matter of food security in ascending order is: Punjab, Haryana, Andhra Pradesh, Kerala, Tamil Nadu, Uttar Pradesh, Gujrat, West Bengal, Rajasthan, Karnataka, Maharashtra, Bihar, Assam, Madhya Pradesh, Orissa, Chhattisgarh and Jharkhand. It should be noted that the inter-state status of food security remains almost unchanged only with some alteration in index values and ranking of the states. This could be noticed from the comparison of Table 5.1 and 5.4.

So far as the relative status of Assam in 2007-11 is concerned, it is more or less the repetition of 2001-05 as her overall food security is found very miserable and she is performing far below than national average in respect of the attainment of food security. Apart from the food accessibility dimension, the performance of Assam in the other two dimensions of food security is found below the national average. The

miserable status of Assam is reflected from the ranking of the states given in Table 5.4 which shows that Assam has achieved Thirteenthth rank out of the 17 major states with regard to the level of food security. This has mainly happened due to the relatively poor performance of Assam in respect of food availability and food absorption dimension in contrast to the food accessibility dimension. This can be evidenced from Table 5.4 which indicates that Assam has got a lower rank of sixteenth in case of Food Availability Index and Food Absorption Index while its rank in respect of Food Accessibility Index is much higher i.e fourth. This shows that like that of 2001-05, poor performance of rural Assam on food security front is mainly attributable to miserable status of food availability and food absorption. This calls for a special attention on the part of the state government to raise the level of these two aspects of food security.

Table 5.5 Distribution of States with regard to the level of Food Security for 2007-11

Very Low	Low	Moderate	High	Very High
Nil	Assam, Madhya Pradesh, Orissa, Chhattisgarh, Bihar and Jharkhand	Haryana, Kerala, Tamil Nadu, Uttar Pradesh, Gujrat, West Bengal, Andhra Pradesh, Karnataka, Maharashtra, and Rajasthan	Punjab	Nil

Source: Researcher's own classification

From Table 5.5, it is observed that 5.88 percent of the states have achieved high level of food security in rural India during the period 2007-11. A total of 35.29 percent of the states have achieved low level of food security while 58.82 percent of the states are found to be moderately food secure. Thus, on the basis of the analysis of the present study, rural India, on the average, can be called a moderately food secure.

Table 5.6 Descriptive Statistics of FSI and Various Dimensional Indices of Rural India, for 2007-11

Statistical Measures	Food Availability Index	Food Accessibility Index	Food Absorption Index	FSI
Range	0.628	0.387	0.329	0.303
Mean	0.542	0.523	0.240	0.435
Standard Deviation	0.157	0.093	0.067	0.080

Source: Calculated by the Researcher

The values of range for different indices indicate that the gap between two extreme states in respect of food availability is quite large while it is relatively low in case of other two dimensions and in the overall level of food security. Thus inequality between two extreme states in rural India is found relatively high in case of food availability. FSI with a mean value of 0.435 exerts that the national level food security of rural India on the average is a moderate one. This is almost the repetition of the result in 2001-05 as it can be verified from Table 5.3. The comparison of mean FSI value from Table 5.6 with individual FSI values of the states from Table 5.4 shows that during 2007-11, the level of food security achieved by Punjab, Haryana, Kerala, Tamil Nadu, Uttar Pradesh, Gujrat, Andhra Pradesh and West Bengal is higher than the national average while it is below national average in case of the other states. The values of standard deviation indicate the inter-state disparities in the level of food security and in different dimensions of food security in rural India. The inter-state disparity is found relatively higher in case of food availability while the disparity is very negligible in case of food accessibility, food absorption and in the level of overall food security.

Table 5.7 Comparison of Food Security Rankings of the States in Rural India between 2001-05 and 2007-11

States	Food Availability Ranking			Food Accessibility Ranking			Food Absorption Ranking			Food Security Ranking		
	2001-05	2007-11	Rank Correlation Coefficient	2001-05	2007-11	Rank Correlation Coefficient	2001-05	2007-11	Rank Correlation coefficient	2001-05	2007-11	Rank Correlation Coefficient
Andhra Pradesh	6	5	R = 0.98*	11	7	R = 0.91*	10	1	R = 0.70*	8	3	R = 0.95*
Assam	16	16		4	4		16	16		13	13	
Bihar	9	10		15	14		6	6		11	12	
Chhattisgarh	15	14		17	17		12	11		16	16	
Gujrat	5	6		6	11		9	7		6	7	
Haryana	2	2		3	2		3	3		2	2	
Jharkhand	17	17		14	16		17	17		17	17	
Karnataka	11	9		9	6		5	8		9	10	
Kerala	12	13		1	1		8	2		3	4	
Madhya Pradesh	13	12		16	15		14	14		14	14	
Maharashtra	10	11		8	8		11	12		10	11	
Orissa	14	15		13	13		15	15		15	15	
Punjab	1	1		2	3		1	10		1	1	
Rajasthan	8	7		12	10		13	13		12	9	
Tamil Nadu	4	4		5	5		2	4		4	5	
Uttar Pradesh	3	3		10	12		7	5		5	6	
West Bengal	7	8	7	9	4	9	7	8				

Source: Calculated by the Researcher,
Note: * means significant at 1 per cent level of significance

Table 5.7 represents a comparison of the rankings of the states with regard to the level of food security and its various dimensions between two periods viz. 2001-05 and 2007-11. So far as food availability ranking is concerned, it is seen that Punjab at the top and Jharkhand at the bottom in both 2001-05 and 2007-11. Thus in case of food availability, no change has taken place regarding the two extreme positions over the two cross sections. It is also observed from Table 5.7 that besides Punjab and Jharkhand, states like Assam, Haryana, Uttar Pradesh and Tamil Nadu have maintained their ranks in both the time periods. Andhra Pradesh, Chhattisgarh, Karnataka, Madhya Pradesh and Rajasthan are found to have improved their food availability rankings. On

the other hand, food availability rankings of the states like Bihar, Gujrat, Kerala, Maharashtra, Orissa and West Bengal have slightly gone down.

So far as food accessibility ranking is concerned, Table 5.7 depicts that Kerala ranks first while Chhattisgarh ranks last in both 2001-05 and 2007-11. Thus in case of food accessibility, no change has taken place regarding the two extreme positions over the two cross sections. Apart from Kerala and Chhattisgarh, the other states which have maintained same positions in both the time periods are: Assam, Maharashtra, Orissa and Tamil Nadu. It is visible from Table 5.7 that six states viz. Andhra Pradesh, Bihar, Haryana, Karnataka, Madhya Pradesh and Rajasthan have experienced improvements in food accessibility rankings. In this connection it is to be noted that the performance of Karnataka and Andhra Pradesh is remarkable as they have jumped to 6th and 7th position in 2007-11 from 9th and 11th position respectively in 2001-05. States like Gujrat, Jharkhand, Punjab, West Bengal and Uttar Pradesh, on the other hand, have experienced with deterioration over food accessibility ranking. The deterioration of food accessibility ranking is severe in case of Gujrat as its rank drops to eleven from six in 2007-11.

Table 5.7 depicts some interesting figures so far as food absorption ranking of the states are concerned. Unlike food availability and food accessibility ranking, we have found some alteration in two extreme positions in case of food absorption. It is seen from Table 5.7 that although Jharkhand ranks last in both the time periods but the first rank holder is not the same. For the period 2001-05, Punjab has secured the first position while in 2007-11, Andhra Pradesh has topped the list. Assam, Bihar, Haryana, Jharkhand, Madhya Pradesh Orissa and Rajasthan have maintained the same ranks on the matter of food absorption. Five states viz. Andhra Pradesh, Chhattisgarh, Gujrat,

Kerala and Uttar Pradesh have experienced improvements over food absorption ranking as observed from Table 5.7. Out of these five states, the achievements of Andhra Pradesh and Kerala are quite spectacular as they have jumped nine steps and six steps higher respectively in 2007-11. The ranks of Karnataka, Maharashtra, Punjab, Tamil Nadu and West Bengal have declined in 2007-11. The deterioration of ranking is horrible in case of Punjab as it has dramatically dropped down to 10th rank in 2007-11 from 1st rank in 2001-05.

So far as overall food security is concerned, Table 5.7 shows that Punjab stands first while Jharkhand ranks last in 2001-05 as well as in 2007-11. States which have maintained the similar ranks with regard to food security other than Punjab and Jharkhand are: Assam, Chhattisgarh, Haryana, Madhya Pradesh and Orissa. Only two states viz. Andhra Pradesh and Rajasthan have become able to improve their food security rankings as visible from Table 5.7. The improvement of Andhra Pradesh in this regard is very satisfactory as it moves up to 3rd position in 2007-11 while Rajasthan has moved up three steps forward in this dimension. States like Bihar, Gujrat, Karnataka, Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh and West Bengal have experienced a slight decline by one step in their food security ranking. Thus one can say that this sort of decline on the part of these states is not that much worrisome.

Table 5.7 also shows that the values of rank correlation coefficient for food security and its various dimensions between two time points viz. 2001-05 and 2007-11 are statistically, positively, and highly significant at 1 percent level of significance. Thus there is positive and significant difference in the food security rankings in rural India. Rank correlation coefficient values for food availability; food accessibility and food security are relatively much closer to 1 in comparison to that of food absorption. This is

mainly due to the fact that ranks of the states on the matter of food availability, food accessibility and food security have not gone up or down by a huge margin, but the same cannot be said for food absorption as it is visible from Table 5.7 that ranks of some states in case of food absorption have moved up and down tremendously. For instance, Andhra Pradesh moves from 10th position in 2001-05 to 1st position in 2007-11, while Punjab slips out to 10th position in 2007-11 from 1st position in 2001-05.

5.2 Analysis on Second Objective:

This section provides results on the second objective of the study by analyzing the relevant secondary data.

Table 5.8 Ranks of the Districts in Rural Assam on Dimensional Indices and on Food Security Index (FSI), 2001-05

Districts	Food Availability Index	Rank	Food Accessibility Index	Rank	Food Absorption Index	Rank	FSI	Rank
Dhubri	0.364	15	0.700	13	0.508	9	0.524	12
Kokhrajhar	0.399	13	0.598	21	0.291	17	0.430	18
Bongaigaon	0.425	10	0.685	18	0.315	15	0.475	15
Goalpara	0.360	16	0.699	14	0.332	14	0.463	17
Barpeta	0.448	5	0.722	11	0.515	8	0.562	6
Nalbari	0.438	6	0.727	10	0.567	2	0.577	4
Kamrup	0.432	8	0.763	5	0.507	10	0.568	5
Darrang	0.528	2	0.694	15	0.449	12	0.557	9
Sonitpur	0.515	3	0.692	16	0.269	18	0.492	13
Lakhimpur	0.432	9	0.730	8	0.303	16	0.489	14
Dhemaji	0.371	14	0.641	20	0.402	13	0.471	16
Morigaon	0.463	4	0.675	19	0.536	6	0.558	8
Nagaon	0.560	1	0.729	9	0.526	7	0.605	2
Golaghat	0.434	7	0.778	3	0.560	3	0.591	3
Jorhat	0.408	12	0.799	2	0.472	11	0.560	7
Sibsagar	0.419	11	0.839	1	0.647	1	0.635	1
Dibrugarh	0.326	18	0.717	12	0.556	4	0.533	10
Tinsukia	0.345	17	0.687	17	0.541	5	0.525	11
Karbi-Anglong	0.300	21	0.565	22	0.234	20	0.367	22
Dima Hasao	0.197	23	0.536	23	0.255	19	0.330	23
Karimganj	0.308	20	0.764	4	0.167	23	0.410	21
Hailakandi	0.325	19	0.739	7	0.194	21	0.419	19
Cachar	0.273	22	0.752	6	0.183	22	0.413	20
All Assam Figure	0.394		0.706		0.406		0.502	

Source: Calculated by the Researcher

Table 5.8 shows that Sibsagar is the most food secure district in rural Assam with a FSI value of 0.635 while Dima Hasao is the least food secure district with a FSI value of 0.330. So far as the dimensional indices are concerned, Nagaon tops the list on the matter of food availability index with an index value of 0.560. Sibsagar ranks first in case of food accessibility index and food absorption index with the index values 0.839 and 0.647 respectively. Dima Hasao is at the bottom with respect to all the dimensional indices of food security except food absorption. In case of food absorption, Karimganj district is placed last. The ranking of the districts on the matter of food security in 2001-05 in ascending order is: Sibsagar, Nagaon, Golaghat, Nalbari, Kamrup, Barpeta, Jorhat, Marigaon, Darrang, Dibrugarh, Tinsukia, Dhubri, Sonitpur, Lakhimpur, Bongaigaon, Dhemaji, Goalpara, Kokhrajhar, Hilakandi, Cachar, Karimganj, Karbi-Anglong and Dima Hasao. It is also observed that the level of food security achieved by Dhubri, Sibsagar, Nagaon, Jorhat, Golaghat, Darrang, Nalbari, Kamrup, Barpeta, Dibrugarh, Tinsukia and Marigaon is higher than the state average while it is below state average in case of the other districts. Thus it means that 52.17 percent of the districts in rural Assam have performed better than the state average on the matter of food security while the performance of the rest 47.83 percent districts in this regard is below the state average.

Another important observation from the Table 5.8 is about the performance of the districts of Barak Valley region of Assam which is comprised of three districts viz. Cachar, Karimganj and Hilakandi district. The observation is that although all these three districts have performed well with regard to food accessibility as depicted from their index values and ranks, but they are placed at the bottom ends in respect of other two dimensions of food security and hence in the level of overall food security.

A close look at Table 5.8 indicates that districts are more or less doing well in terms of food accessibility and food absorption but their performance on the front of food availability is quite miserable. This is reflected in terms of relatively lower values of Food Availability Index of the districts. Even Nagaon which tops the list on the matter of food availability index is having a very low index value of 0.560. From these statistics as shown in Table 5.8, it can be said that the prospects of food security for the districts in rural Assam is not that bright mainly because of vulnerable food availability situation across the districts.

Table 5.9 Distribution of Districts with regard to the level of Food Security in Rural Assam, 2001-05

Very Low	Low	Moderate	High	Very High
Nil	Karbi-Anglong, Dima Hasao	Jorhat, Golaghat, Darrang, Nalbari, Sonitpur, Kamrup, Barpeta, Lakhimpur, Marigaon, Bongaigaon, Dibrugarh, Tinsukia, Goalpara, Dhubri, Dhemaji, Hilakandi, Kokhrajhar, Karimganj, Cachar,	Sibsagar, Nagaon	Nil

Source: Researcher's classification

From the Table 5.9, it can be easily worked out that 82.62 percent of the districts have achieved moderate level of food security while 8.69 percent districts have achieved low level of food security and the rest 8.69 percent districts have achieved high level of food security. Table 5.9 also shows that not a single district falls under the category of very low and very high level of food security. Thus, on the average, Assam could be called a moderately food secure state in 2001-05.

Table 5. 10 Descriptive Statistics of FSI and various Dimensional Indices of Rural Assam, 2001-05

Statistical Measures	Food Availability Index	Food Accessibility Index	Food Absorption Index	FSI
Range	0.363	0.303	0.480	0.306
Mean	0.394	0.706	0.406	0.502
Standard Deviation	0.083	0.069	0.144	0.079

Source: Calculated by the Researcher

Table 5.10 shows that the values range for Food Absorption Index is relatively higher than that of FSI and other two dimensional indices. This means that the gap between two extreme districts in respect of food absorption is quite large while it is relatively low in case of other two dimensions and in the overall level of food security. FSI with a mean value of 0.502 exerts that the food security status of rural Assam, on the average is a moderate one. It is also noticeable from Table 5.10 that on the average, rural Assam is performing well in terms of food accessibility but her performance on the matter of the other two dimensions in 2001-05 is not up to the mark. The values of standard deviation indicate that the inter-district disparity is relatively higher in case of food absorption as compared to FSI and other dimensional indices.

Table 5.11 Ranks of the Districts in Rural Assam on Dimensional Indices and on Food Security Index (FSI), 2007-11

Districts	Food Availability Index	Rank	Food Accessibility Index	Rank	Food Absorption Index	Rank	FSI	Rank
Dhubri	0.336	12	0.707	17	0.557	11	0.533	12
Kokhrajhar	0.324	16	0.654	20	0.527	14	0.502	18
Bongaigaon	0.334	13	0.730	13	0.626	4	0.564	8
Goalpara	0.339	11	0.670	19	0.569	10	0.526	13
Barpeta	0.416	1	0.739	11	0.639	3	0.598	2
Nalbari	0.381	4	0.792	2	0.937	1	0.703	1
Kamrup	0.330	15	0.744	10	0.653	2	0.576	4
Darrang	0.393	3	0.724	14	0.590	8	0.569	7
Sonitpur	0.333	14	0.720	15	0.507	15	0.519	15
Lakhimpur	0.344	10	0.717	16	0.500	17	0.520	14
Dhemaji	0.346	9	0.640	21	0.480	18	0.489	19
Morigaon	0.412	2	0.676	18	0.576	9	0.555	9
Nagaon	0.371	5	0.735	12	0.611	5	0.573	5
Golaghat	0.359	6	0.765	7	0.503	16	0.542	10
Jorhat	0.347	8	0.768	5	0.592	7	0.569	6
Sibsagar	0.3480	7	0.821	1	0.599	6	0.589	3
Dibrugarh	0.293	18	0.777	3	0.542	12	0.537	11
Tinsukia	0.226	20	0.766	6	0.528	13	0.507	17
Karbi-Anglong	0.191	22	0.568	22	0.400	22	0.386	22
Dima Hasao	0.150	23	0.551	23	0.322	23	0.341	23
Karimganj	0.244	19	0.759	9	0.439	21	0.481	21
Hailakandi	0.313	17	0.762	8	0.446	20	0.507	16
Cachar	0.221	21	0.773	4	0.450	19	0.482	20
All Assam Figure	0.320		0.720		0.548		0.529	

Source: Calculated by the Researcher

Table 5.11 shows that Nalbari is the most food secure district with FSI value of 0.703 and Dima Hasao is the least food secure district with FSI value of 0.341 in rural

Assam in 2007-11. Barpeta tops the list on the matter of food availability, although its index value is not satisfactory at all. Sibsagar comes first in respect of food accessibility with much higher index value of 0.821 while Nalbari sits at the top in case of food absorption with a spectacular index value of 0.937. The performance of Dima Hasao is the worst among all districts in 2007-11 as it ranks last in all the dimensions of food security. This is nothing but the repetition of the situation of 2001-05 on the part of the Dima Hasao. The ranking of the districts on the matter of food security in 2007-11 in ascending order is as follows: Nalbari, Barpeta, Sibsagar, Kamrup, Nagaon, Jorhat, Darrang, Bongaigaon, Marigaon, Golaghat, Dibrugarh, Dhubri, Goalpara, Lakhimpur, Sonitpur, Hilakandi, Tinsukia, Kokhrajhar, Dhemaji, Cachar, Karimganj, Karbi-Anglong and Dima Hasao.

It is also observed that the level of food security achieved by Nalbari, Barpeta, Sibsagar, Kamrup, Nagaon, Jorhat, Darrang, Bongaigaon, Dhubri, Marigaon, Golaghat and Dibrugarh is higher than the state average while it is below state average in case of the other districts. Thus it means that 52.17 percent of the districts in rural Assam have performed better than the state average on the matter of food security while the performance of the rest 47.83 percent districts in this regard is below the state average. This is almost the repetition of the situation of 2001-05 with one exception. A comparison between Table 5.8 and Table 5.11 indicates that Bongaigaon has replaced Tinsukia in the group of the districts experiencing food security higher than the state average. This is the only exception we are talking about.

So far as the districts of Barak Valley region are concerned, during 2007-11 too their performance in the dimensions of food availability and food accessibility is very shocking. However these districts have done well on the matter of food accessibility.

This is evident from the values of various dimensional indices and ranks of these districts as shown in Table 5.11.

A close look at Table 5.11 indicates that districts are more or less doing well in terms of food accessibility and food absorption but their performance on the front of food availability is quite miserable. This is reflected in terms of relatively lower values of Food Availability Index of the districts. Even Barpeta which tops the list on the matter of food availability index is having a very low index value of 0.416. From these observations in Table 5.11, it can be said that the prospects of food security for the districts in rural Assam is not that bright mainly because of vulnerable food availability situation across the districts.

Table 5.12 Distribution of Districts with regard to the level of Food Security in Rural Assam, 2007-11

Very Low	Low	Moderate	High	Very High
Nil	Karbi-Anglong and Dima Hasao	Jorhat, Golaghat, Darrang, Sonitpur, Kamrup, Barpeta, Lakhimpur, Marigaon, Bongaigaon, Dibrugarh, Tinsukia, Goalpara, Dhubri, Dhemaji, Hilakandi, Kokhrajhar, Karimganj, Cachar, Sibsagar, Nagaon	Nalbari	Nil

Source: Researcher's own classification

From the Table 5.12, it is observed that 86.96 percent of the districts have achieved moderate level of food security while 8.69 percent districts have achieved low level of food security and the rest 4.35 percent districts have achieved high level of food security. Table 5.9 also shows that not a single district falls under the category of very

low and very high level of food security. Thus, on the average, Assam could be called a moderately food secure state in 2007-11 as well. It should also be noted that Nalbari which was a moderately food secure district in 2001-05 has become highly food secure in 2007-11 while Nagaon and Sibsagar which were highly food secure in 2001-05 have become moderately food secure in 2007-11.

Table 5. 13 Descriptive Statistics of FSI and various Dimensional Indices of Rural Assam, 2007-11

Statistical Measures	Food Availability Index	Food Accessibility Index	Food Absorption Index	FSI
Range	0.266	0.270	0.615	0.362
Mean	0.320	0.720	0.548	0.529
Standard Deviation	0.068	0.066	0.115	0.070

Source: Calculated by the Researcher

Table 5.13 represents that the range of values in respect of Food Absorption Index is relatively higher than that of FSI and other two dimensional indices. This means that the gap between two extreme districts in respect of food absorption is quite large while it is relatively low in case of other two dimensions and in the overall level of food security. FSI with a mean value of 0.529 indicates that the food security status of rural Assam, on the average is a moderate one. It is also noticeable from Table 5.13 that on the average, rural Assam is performing well in terms of food accessibility and food absorption but her performance on the matter of food availability in 2007-11 is not up to the mark. The values of standard deviation indicate that the inter-district disparity is relatively higher in case of food absorption as compared to FSI and other two dimensional indices.

Table 5.14 Comparison of Descriptive Statistics of FSI and various Dimensional Indices of Rural Assam for 2001-05 and 2007-11

Statistical Measures	Food Availability Index		Food Accessibility Index		Food Absorption Index		FSI	
	2001-05	2007-11	2001-05	2007-11	2001-05	2007-11	2001-05	2007-11
Range	0.363	0.266	0.303	0.270	0.480	0.615	0.306	0.362
Mean	0.394	0.320	0.706	0.720	0.406	0.548	0.502	0.529
Standard Deviation	0.083	0.068	0.069	0.066	0.144	0.115	0.079	0.070
Mean Difference	t =3.26*		t = 0.66		t =3.60*		t =1.19	

Source: Calculated by the Researcher.

Note: * means significant at 1 percent level of significance

Table 5.14 indicates that the difference between two extreme states in respect of food availability and food accessibility has declined in 2007-11 while this difference has increased in case of food absorption and overall food security. It is also visible from Table 5.14 that the disparity between two extreme states on the matter of food absorption is much higher. The mean values for two time points indicate that except food availability, rural Assam has shown a steady progress in the other dimensions of food security and also at overall level. However the t values in Table 5.14 indicates the real story from statistical point of view. It can be easily concluded from the Table 5.14 that the status of food security in rural Assam has not improved statistically significantly over time although it is seen that there is a statistically significant increase in the level of food absorption. Food availability is found to be declined statistically significantly in 2007-11. Comparison of the values of standard deviations for two cross sections in Table 5.14 indicates that disparities among the districts on the issue of food security and its various dimensions have declined in 2007-11.

Table 5.15 Comparison of Food Security Rankings of the Districts in Rural Assam between 2001-05 and 2007-11

Districts	Food Availability Ranking			Food Accessibility Ranking			Food Absorption Ranking			Food Security Ranking		
	2001-05	2007-11	Rank Correlation Coefficient	2001-05	2007-11	Rank Correlation Coefficient	2001-05	2007-11	Rank Correlation Coefficient	2001-05	2007-11	Rank Correlation Coefficient
Dhubri	15	12	R = 0.83*	13	17	R = 0.76*	9	11	R = 0.67*	12	12	R = 0.89*
Kokhrajhar	13	16		21	20		17	14		18	18	
Bongaigaon	10	13		18	13		15	4		15	8	
Goalpara	16	11		14	19		14	10		17	13	
Barpeta	5	1		11	11		8	3		6	2	
Nalbari	6	4		10	2		2	1		4	1	
Kamrup	8	15		5	10		10	2		5	4	
Darrang	2	3		15	14		12	8		9	7	
Sonitpur	3	14		16	15		18	15		13	15	
Lakhimpur	9	10		8	16		16	17		14	14	
Dhemaji	14	9		20	21		13	18		16	19	
Morigaon	4	2		19	18		6	9		8	9	
Nagaon	1	5		9	12		7	5		2	5	
Golaghat	7	6		3	7		3	16		3	10	
Jorhat	12	8		2	5		11	7		7	6	
Sibsagar	11	7		1	1		1	6		1	3	
Dibrugarh	18	18		12	3		4	12		10	11	
Tinsukia	17	20		17	6		5	13		11	17	
Karbi-Anglong	21	22		22	22		20	22		22	22	
Dima Hasao	23	23		23	23		19	23		23	23	
Karimganj	20	19	4	9	23	21	21	21				
Hailakandi	19	17	7	8	21	20	19	16				
Cachar	22	21	6	4	22	19	20	20				

Source: Calculated by the Researcher,

Note: * means significant at 1 percent level of significance

Table 5.15 represents a comparison of the rankings of the districts with regard to the level of food security and its various dimensions between two periods viz. 2001-05 and 2007-11. So far as food availability ranking is concerned, it is seen that Nagaon

sits at the top in 2001-05 but in 2007-11, it is Barpeta district which ranks first. It is observed from the Table 5.15 that there actually takes place an exchange of ranks between Nagaon and Barpeta in case of food availability during the period of reference. Dima Hasao ranks at the bottom in 2001-05 as well as in 2007-11. It is evident from Table 5.15 that in case of food availability, ranks of only two districts viz. Dibrugarh and Dima Hasao have remained unchanged. Districts like Dhubri, Goalpara, Barpeta, Nalbari, Dhemaji, Morigaon, Golaghat, Jorhat, Sibsagar, Karimganj, Hilakandi and Cachar are found to have improved their food availability rankings. In this regard it must be noted that Dhubri, Goalpara, Barpeta, Dhemaji, Jorhat and Sibsagar have experienced major improvements in food availability ranking. On the other hand, food availability rankings of the districts like Kokhrajhar, Bongaigaon, Kamrup, Sonitpur, Darrang, Lakhimpur, Nagaon, Tinsukia and KarbiAnglong have gone down and two districts viz. Kamrup and Sonitpur have embraced major deterioration in the food availability ranking.

So far as food accessibility ranking is concerned, Table 5.15 depicts that Sibsagar has obtained first rank while Dima Hasao is placed at last in both the time points. Along with Sibsagar and Dima Hasao, Barpeta and Karbi Anglong have also maintained the similar ranks as shown from Table 5.15. Kokhrajhar, Bongaigaon, Nalbari, Darrang, Sonitpur, Morigaon, Dibrugarh, Tinsukia and Cachar have improved their food accessibility rankings while Dhubri, Goalpara, Kamrup, Lakhimpur, Dhemaji, Nagaon, Golaghat, Jorhat, Karimganj and Hilakandi districts are faced with declining ranks. The major improvements in the food accessibility ranking are made by Bongaigaon, Nalbari, Dibrugarh and Tinsukia while districts like Goalpara, Kamrup, Lakhimpur and Karimganj are associated with major deterioration in ranking.

Table 5.15 represents that Sibsagar has secured first position in 2001-05 while Nalbari has secured first position in 2007-11 in respect of food absorption. In this regard, Karimganj and Dima Hasao are placed at the bottom in 2001-05 and 2007-11 respectively. No district is found to have similar ranks over two periods. Table 5.15 shows that improvement in food absorption ranking is achieved by Kokhrajhar, Bongaigaon, Barpeta, Kamrup, Darrang, Sonitpur, Nagaon, Jorhat, Nalbari, Karimganj, Hailakandi and Cachar while Dhubri, Goalpara, Morigaon, Dibrugarh, Tinsukia, Lakhimpur, Dhemaji, Golaghat, Sibsagar, Karbi Anglong and Dima Hasao have experienced a decline in ranking. Major jumps in food absorption ranking are made by Bongaigaon, Barpeta and Kamrup while Golaghat, Sibsagar, Dibrugarh and Tinsukia have come across major turmoil in food absorption ranking during 2007-11.

So far as ranking of overall food security is concerned, it is visible from Table 5.15 that Sibsagar has obtained first rank in 2001-05 but it is Nalbari district which has stood first in 2007-11. Dima Hasao has got the last rank in both the time periods. Food security rankings of Dhubri, Kokhrajhar, Lakhimpur, KarbiAnglong , Karimganj and Cachar have remained the same over two periods. Bongaigaon, Nalbari, Goalpara, Barpeta, Kamrup, Darrang, Jorhat and Hailakandi have improved their food security ranking in 2007-11 while the ranks of Sonitpur, Nagaon, Dhemaji, Morigaon, Golaghat, Sibsagar, Dibrugarh and Tinsukia have declined. Remarkable jumps in food security ranking are made by Bongaigaon, Goalpara and Barpeta districts while districts like Golaghat and Tinsukia have come across serious turmoil in food security ranking in 2007-11.

Table 5.15 also shows the values of rank correlation coefficient for food security index and various dimensional indices between two time points viz. 2001-05

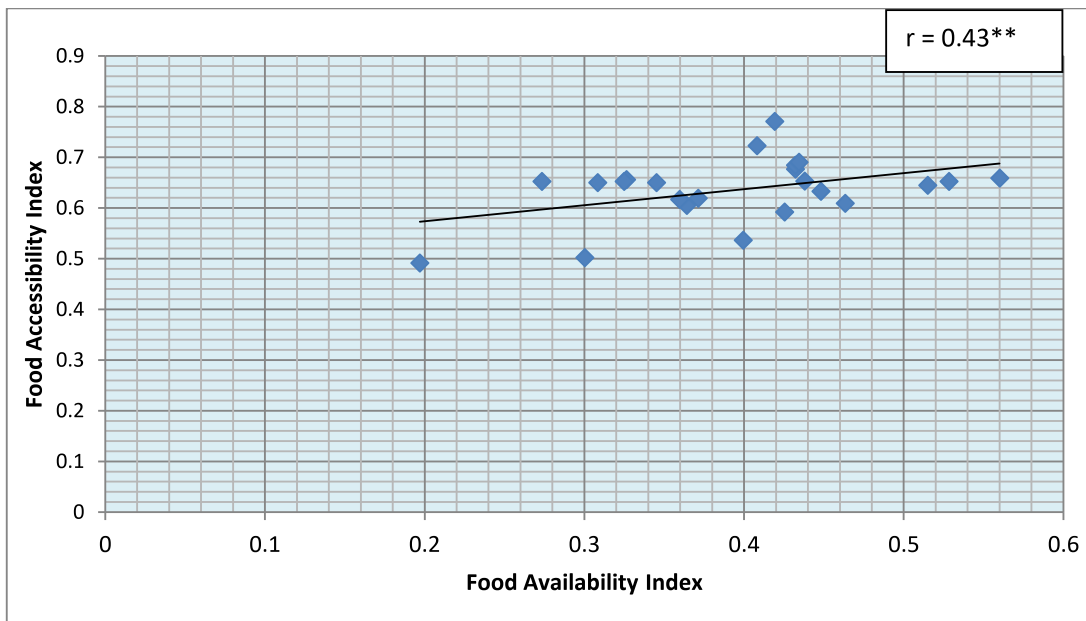
and 2007-11. It is clearly seen that all the rank correlation coefficient values are positively and statistically significant at 1 percent level of significance. This means that there is significant difference in the ranking of districts in rural Assam with regard to food security and its various dimensions between two time periods. The positive values of rank correlation coefficients indicate that overall the districts are moving in the same direction so far as their ranking in the context of food security and its various dimensions are concerned. It is to be noted that the rank correlation coefficient values for food availability, food accessibility and overall food security are relatively much higher in comparison to that of food absorption. This is mainly due to the fact that ranks of the districts in respect of food availability, food accessibility and food security have not fluctuated by a huge margin, but the same cannot be said for food absorption as it is very much visible from Table 5.15 that ranks of some districts in this respect have fluctuated extremely. For instance, the rank of Bongaigaon has increased from 15th position in 2001-05 to 4th while that of Kamrup has increased from 10th position to 2nd in 2007-11. On the other hand, districts like Golaghat and Dibrugarh have slipped out to 16th and 12th positions in 2007-11 from their respective 3rd and 4th positions in 2001-05. Further not a single district is found with similar rank in case of food absorption. This is the most important factor responsible for relatively lower rank correlation coefficient value for food absorption.

5.2.1 Association between various Dimensional Indices of Food Security in Rural Assam:

This section shows the nature and strength of the relationship between various dimensional indices of food security in rural Assam in terms of the scatter diagram as

well as Karl Pearson's Correlation Coefficient both for 2001-05 and 2007-11. This enabled us to compare a particular dimension of food security in relation to the other.

Figure 5.1: Scatter Diagram between Food Availability Index and Food Accessibility Index of Rural Assam, 2001-05



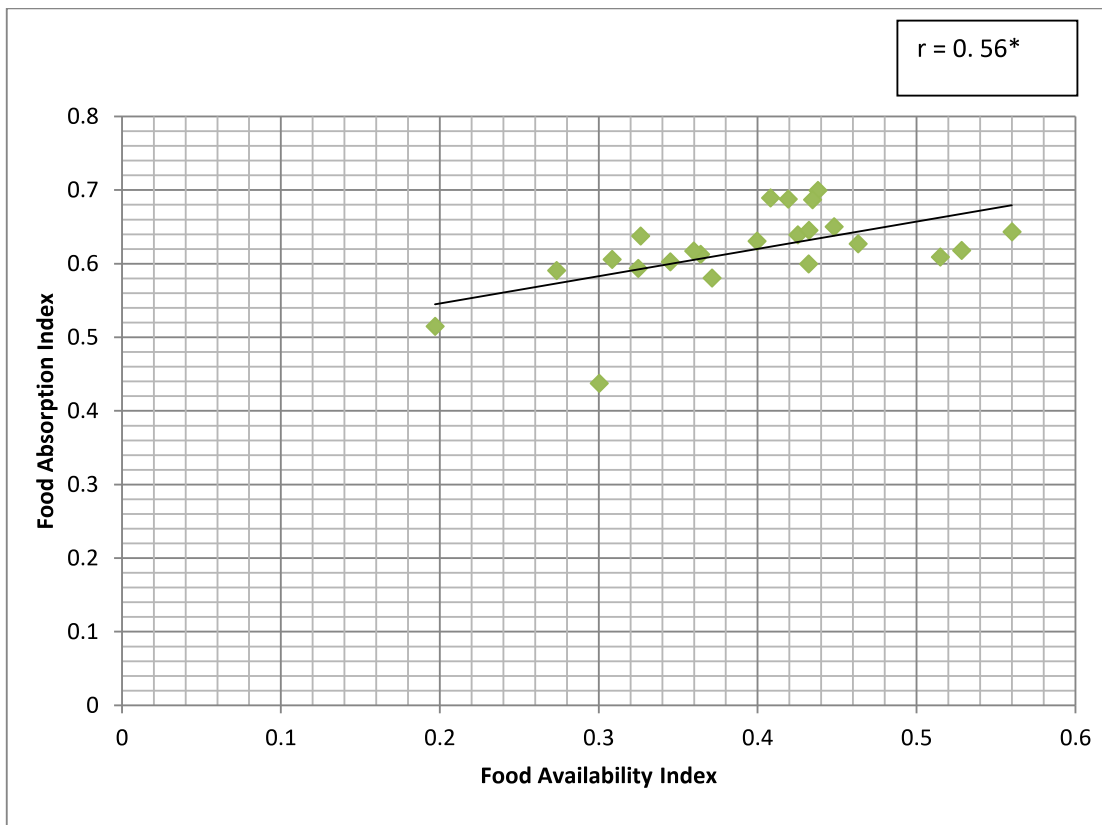
Source: Based on calculated value by the researcher

Note: ** means correlation is significant at 5 % level of significance

The scatter plot in Figure 5.1 depicted a positive association between Food Availability Index and Food Accessibility Index for rural Assam. This means that availability and accessibility of food are moving in the same direction. The value of Karl Pearson's Correlation Coefficient $r = 0.43^{**}$ indicates the strength and statistical significance of the association between Food Availability Index and Food Accessibility Index for rural Assam. The interpretation of the value of $r = 0.43^{**}$ in this context is that there is positive and moderate relationship between food availability and food accessibility and this relationship is statistically significant at 5 percent level of significance. Since the value of r in this case is not that high, it provides the indication that although food

availability and food accessibility are moving together but the speed of this movement is slow.

Figure 5.2 Scatter Diagram between Food Availability Index and Food Absorption Index of Rural Assam, 2001-05



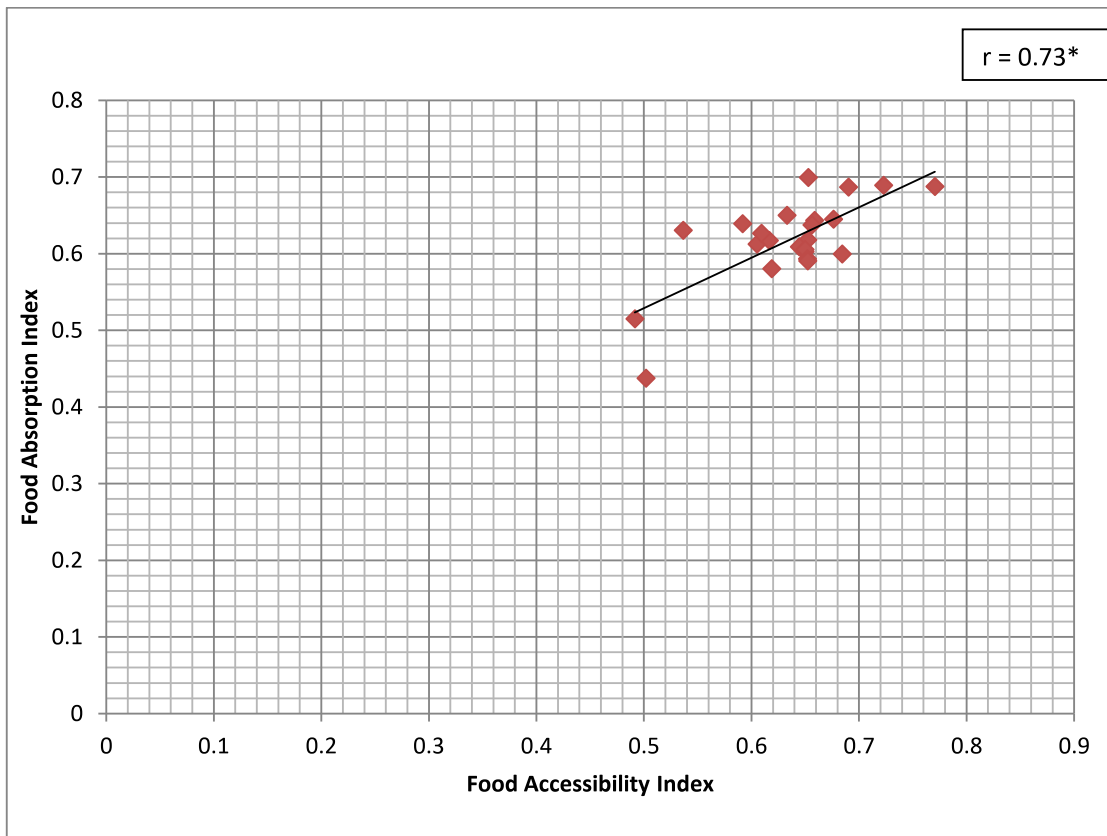
Source: Based on calculated value by the researcher

Note: * means correlation is significant at 1 % level of significance

The scatter plot in Figure 5.2 shows a positive association between Food Availability Index and Food Absorption Index for rural Assam. This means that availability and absorption of food are moving in the same direction. The value of Karl Pearson's Correlation Coefficient $r = 0.56^*$ indicates the strength and statistical significance of the association between Food Availability Index and Food Absorption Index for rural Assam. The interpretation of the value of $r = 0.56^*$ in this context is that there is

positive and moderate relationship between food availability and food absorption and this relationship is statistically significant at 1 percent level of significance.

Figure 5.3 Scatter Diagram between Food Accessibility Index and Food Absorption Index of Rural Assam, 2001-05



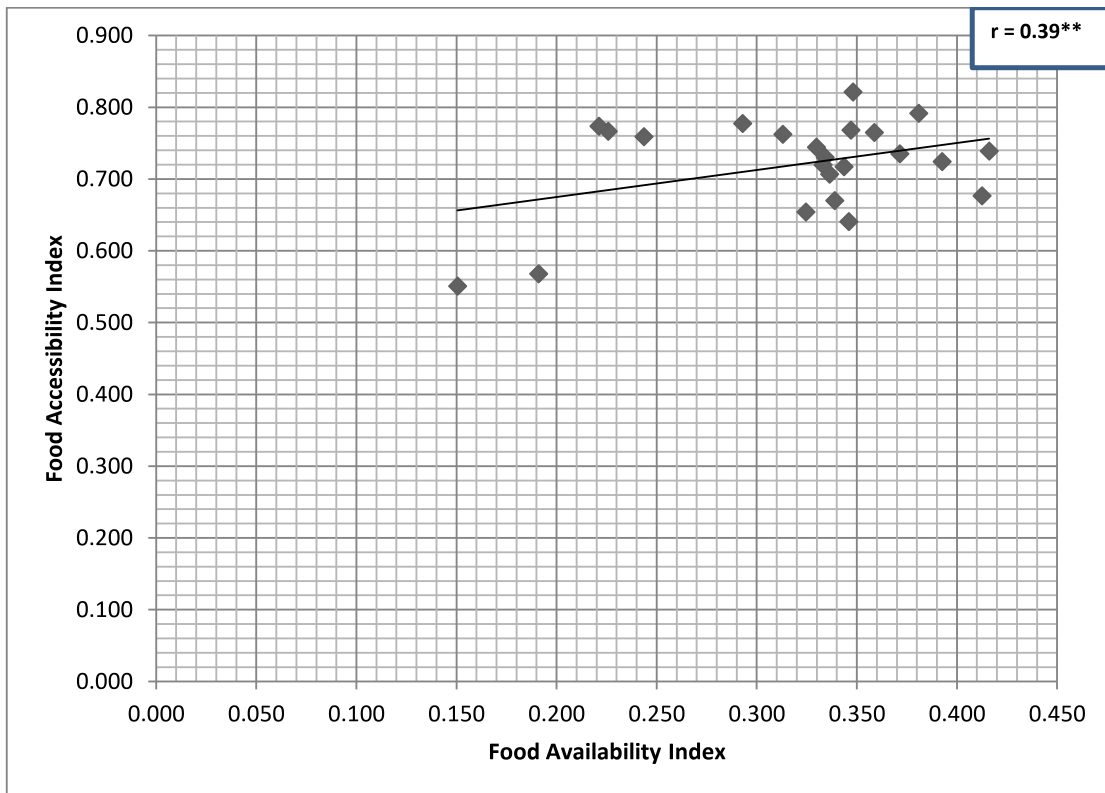
SourceBased on calculated value by the researcher

Note: * means correlation is significant at 1 % level of significance

The scatter plot in Figure 5.3 shows a positive association between Food Accessibility Index and Food Absorption Index for rural Assam. This means that accessibility and absorption of food are moving in the same direction. The value of Karl Pearson's Correlation Coefficient $r = 0.73^*$ represents the strength and statistical significance of the association between Food Accessibility Index and Food Absorption Index for rural Assam. The interpretation of the value of $r = 0.73^*$ in this context is that there is

positive and strong relationship between food accessibility and food absorption and this relationship is statistically significant at 1 percent level of significance. Relatively higher r value in this case gives the indication that accessibility and absorption of food are moving together at a faster rate.

Figure 5.4 Scatter Diagram between Food Availability Index and Food Accessibility Index of Rural Assam, 2007-11



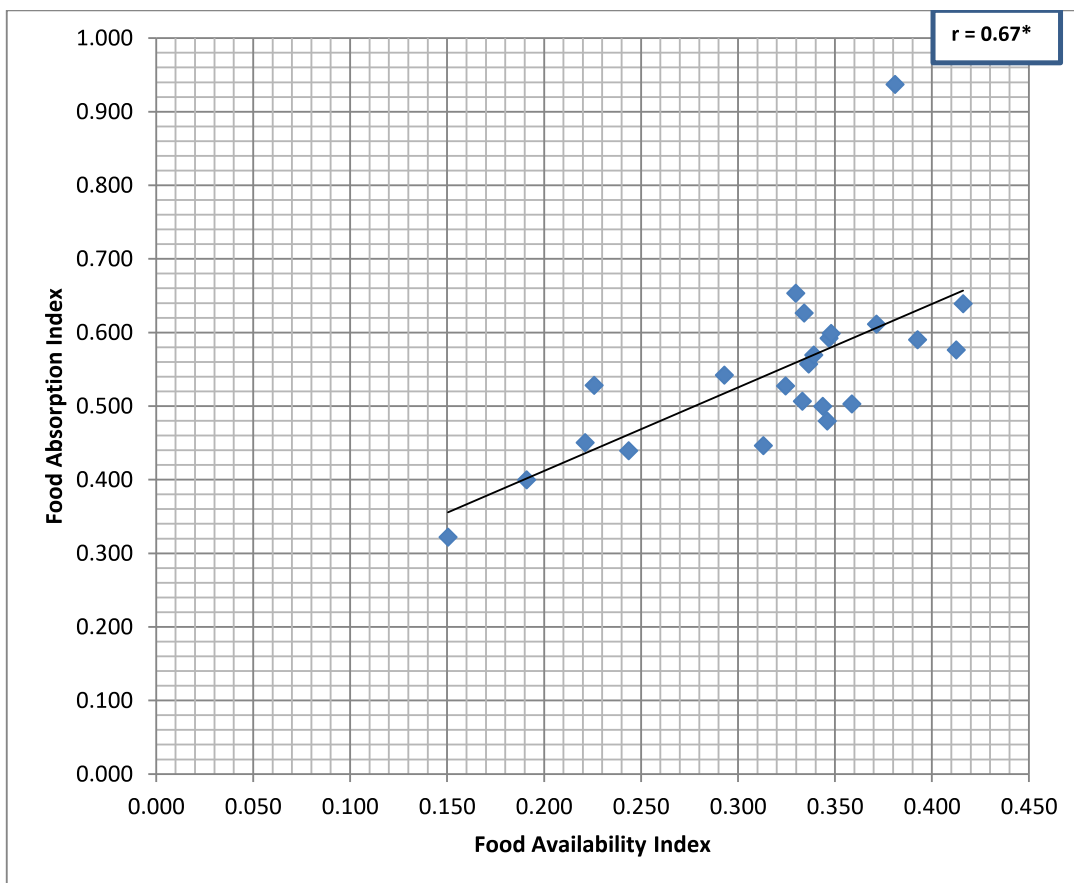
Source: Based on calculated value by the researcher

Note: ** means correlation is significant at 5 % level of significance.

The scatter plot in Figure 5.4 represents a positive association between Food Availability Index and Food Accessibility Index for rural Assam. This means that availability and accessibility of food are also moving in the same direction in 2007-11 like that of 2001-05. The value of Karl Pearson's Correlation Coefficient $r = 0.39^{**}$ indicates the strength and statistical significance of the association between Food

Availability Index and Food Accessibility Index numerically. The interpretation of the value of $r = 0.39^{**}$ is that there is positive and weak relationship between food availability and food accessibility and this relationship is statistically significant at 5 percent level of significance. Since the value of r in this case is low, it provides the indication that although food availability and food accessibility are moving together but the speed of this movement is slow. It should be further noted that the association between food availability and food accessibility is found to be relatively weaker in 2007-11 in comparison to that of 2001-05.

Figure 5.5 Scatter Diagram between Food Availability Index and Food Absorption Index of Rural Assam, 2007-11

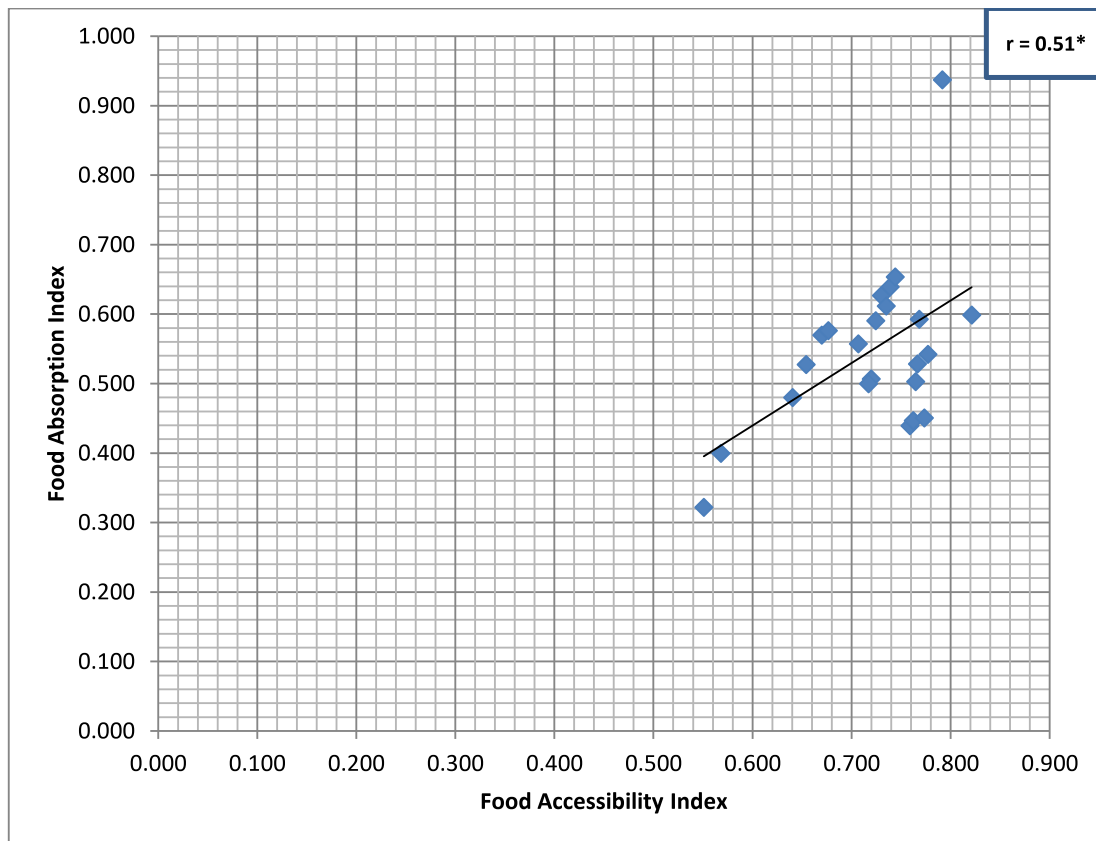


Source: Based on calculated value by the researcher

Note: * means correlation is significant at 1 % level of significance

Scatter plot in Figure 5.5 shows that availability and absorption of food are positively correlated in 2007-11. Similar sort of association between these two is also found in 2001-05 as visible from Figure 5.2. The value of r indicates strong association between availability and absorption of food and this association is also statistically significant at 1 % level of significance. It is also to be noted that the association between food availability and food absorption is found to be relatively stronger in 2007-11 in comparison to that of 2001-05.

Figure 5.6 Scatter Diagram between Food Accessibility Index and Food Absorption Index of Rural Assam, 2007-11



Source: Based on calculated value by the researcher

Note: * means correlation is significant at 1 % level of significance.

Scatter plot in Figure 5.6 depicts that accessibility and absorption of food are positively correlated in 2007-11. Similar sort of association between these two is also found in 2001-05 as visible from Figure 5.3. The value of r indicates a strong association between accessibility and absorption of food and this association is also statistically significant at 1 % level of significance. It is also to be noted that the association between food accessibility and food absorption is found to be relatively weaker in 2007-11 in comparison to that of 2001-05.

5.3 Analysis on Third Objective:

The results of the third objective are incorporated in two sections viz. 5.3.1 and 5.3.2 respectively. Section 5.3.1 provides results related to rural Assam's relative status regarding per capita purchase of rice and wheat while Section 5.3.2 portrays results in respect of diversion of rice and wheat in Assam in relation to the other major states of India.

5.3.1 Status of Rural Assam regarding Per capita Purchase of Rice and Wheat:

The figure in Table 5.16 shows the relative status of rural Assam in respect of per capita purchase of rice during the period 1999-2000 to 2007-08. The relative rankings visualized in Table 5.16 indicate that the position of rural Assam in respect of per capita purchase of PDS rice remains more or less stable. It is also visible from the Table 5.16 that the figure of Assam's per capita purchase of PDS rice is lower than national average throughout during the study period. The highest gap in this regard is observed in the year 2004-05 where the per capita purchase of PDS rice is below the national average by 0.43 kg per month. The lowest gap, on the other hand, is observed in the year 2006-07 where the per capita purchase of PDS rice is below the national average by some what a negligible amount of 0.04 kg per month. The gap with the first

rank state in this regard, however is on the verge of increase every year as reflected from the Table 5.16.

Table 5.16 Per Capita Purchase of PDS Rice in Rural Assam in relation to the rest of Rural India (in terms of Kg/month)

States	1999-2000	Rank	2001-02	Rank	2004-05	Rank	2006-07	Rank	2007-08	Rank
Andhra Pradesh	2.3	3	1.8	2	2.57	2	3.17	2	3.48	2
Assam	0.71	6	0.6	5	0.48	8	1.11	7	1.01	7
Bihar	0	11	0	9	0.04	14	0.1	15	0.07	15
Chhattisgarh	NA	11	0.4	6	1.45	5	2.4	3	3.17	3
Gujrat	0.38	7	0.2	7	0.24	11	0.3	11	0.26	13
Haryana	0	11	0	9	0	15	0.12	14	0.09	14
Jharkhand	NA	11	0.1	8	0.15	12	0.22	13	0.31	12
Karnataka	1.2	5	1.4	3	2.39	3	2.16	4	1.85	6
Kerala	4.14	1	1.8	2	1.71	4	2.04	5	2.24	4
Madhya Pradesh	0.22	9	0.1	8	0.36	9	0.29	12	0.46	10
Maharashtra	0.47	5	0.4	6	0.61	7	0.77	8	0.85	8
Orissa	1.53	4	1.2	4	0.9	6	1.29	6	1.93	5
Punjab	0	11	0	9	0	15	0.05	16	0.01	17
Rajasthan	0	11	0	9	0	15	0.03	17	0.04	16
Tamil Nadu	3.16	2	3.4	1	4.13	1	4.7	1	4.84	1
Uttar Pradesh	0.11	10	0.1	8	0.14	13	0.43	9	0.64	9
West Bengal	0.23	8	0.2	7	0.27	10	0.35	10	0.4	11
All Rural India Figure	0.85		0.69		0.91		1.15		1.27	

Source: Khara (2011); Data on the per capita purchase of rice is not available for Chhattisgarh and Jharkhand in 1999-2000 as these two states are created as new states in 2000.

Table 5.17 Per Capita Purchase of PDS Wheat in Rural Assam in relation to the rest of Rural India (in terms of Kg/month)

States	1999-2000	Rank	2001-02	Rank	2004-05	Rank	2006-07	Rank	2007-08	Rank
Andhra Pradesh	0	-	0	-	0	-	0.01	13	0.01	15
Assam	0	-	0	-	0	-	0.01	13	0.02	14
Bihar	0.15	7	0	-	0.06	12	0.07	11	0.09	12
Chhattisgarh	NA	9	0.1	4	0.08	11	0.07	11	0.03	13
Gujrat	0.55	2	0.5	1	0.54	4	0.48	5	0.43	6
Haryana	0	9	0	-	0.23	6	0.64	2	0.55	4
Jharkhand	NA	9	0.1	4	0.11	10	0.18	8	0.14	11
Karnataka	0.3	4	0.3	2	0.42	5	0.35	6	0.36	8
Kerala	0.44	3	0.1	4	0.17	8	0.3	7	0.31	9
Madhya Pradesh	0.16	6	0.5	1	0.91	1	0.62	3	1.1	1
Maharashtra	0.67	1	0.5	1	0.86	3	0.88	1	0.88	2
Orissa	0	-	0	-	0	14	0.01	13	0	16
Punjab	0	-	0	-	0.02	13	0.05	12	0.54	5
Rajasthan	0.2	5	0.3	2	0.89	2	0.6	4	0.63	3
Tamil Nadu	0.14	8	0	5	0.08	11	0.12	10	0.14	11
Uttar Pradesh	0.18	6	0.2	3	0.19	7	0.3	7	0.41	7
West Bengal	0.15	7	0.1	4	0.15	9	0.17	9	0.22	10
All Rural India Figure	0.17		0.16		0.28		0.29		0.35	

Source: Khera (2011); Data on the per capita purchase of rice is not available for Chhattisgarh and Jharkhand in 1999-2000 as these two states are created as new states in 2000.

The Table 5.17 represents that from the year 1999-2000 to 2004-05, there is no purchase of PDS wheat in rural Assam. This is not that surprising as some other states have also been found to be absent from purchasing of PDS wheat in the referred period as shown in Table 5.17. Although Assam has got her place in the map of PDS wheat purchase from 2006-07 onwards, the amount is very negligible as depicted from Table 5.17. PDS wheat purchase is also far below in rural Assam in comparison to the national average. The gap with the first rank holder states in this respect is also very high. One main reason for such low wheat purchase in rural Assam may be the fact that Assam is mainly a rice consuming state. However it is also important to note that even the overall purchasing of wheat in rural India is not satisfactory one as the figures shown in Table 5.17 are much lower than 1 kg per month. Not a single state has

recorded per capita purchase of PDS wheat by 1 kg during 1999-2000 to 2007-08. Thus it can be said that PDS purchase of wheat is worse in rural India while it is rather worst in the context of rural Assam.

Table 5.18 Per Capita Purchase of Rice and Wheat in Rural Assam (kg/month): A Comparison

Years	Per capita purchase of rice	Per capita purchase of wheat	Mean Difference
1999-2000	0.71	0	t = 3.05*
2001-02	0.6	0	
2004-05	0.48	0	
2006-07	1.11	0.01	
2007-08	1.01	0.02	
Average purchase	0.78	0.006	

Source: Data on per capita purchase of rice and wheat is taken from Khera (2011) and the value of mean difference is calculated by the researcher; Note: * represents significant at 1 % level of significance

The data as in Table 5.18 shows that per capita purchase of rice is much higher than that of wheat. The average purchase of rice during 1999-2000 to 2007-08 is found 0.78 kg per month. However the average purchasing of wheat during the same period is very low as indicated by the amount 0.006 kg per month as in Table 5.18. The mean difference between per capita purchase of PDS rice and that of PDS wheat is also found statistically highly significant. It is seen from Table 5.18 that the first three years of the referred period have even experienced the absence of PDS wheat purchase. As mentioned in the analysis of the Table 5.17 earlier that Assam is primarily a rice consuming state and may be the main cause of such low purchase of PDS wheat. As far as the purchase of PDS rice is concerned, the last two years of the referred period as depicted from Table 5.18 indicates that the purchasing of rice from PDS has increased

by more than 1 kg per month. Thus in line with Khera's framework (2011), it could be said that Assam has become a reviving state with regard to purchase of per capita PDS rice in the rural context from 2006-07 onwards. This is a good sign as it is reflecting some sort of success of PDS in rural Assam at least in case of rice. On the other hand, Assam is a languishing state in respect of PDS wheat purchase as there is not a single instance of PDS wheat purchasing by more than 1 kg per month throughout the reference period. This strongly suggests continuation of PDS programme at least in case of rice in rural Assam.

Table 5.19 Per Capita Purchase of Rice in Assam (kg/month): A Rural-Urban Comparison

Years	Per capita purchase of rice		Mean Difference
	Rural Assam	Urban Assam	
1999-2000	0.71	0.57	t = 6.45*
2001-02	0.6	0.3	
2004-05	0.48	0.18	
2006-07	1.11	0.47	
2007-08	1.01	0.03	
Average purchase	0.78	0.31	

Source: Data on per capita purchase of rice in rural and urban Assam is taken from Khera (2011) and the value of mean difference is calculated by the researcher; Note: * represents significant at 1 % level of significance

It is observed from Table 5.19 that per capita purchase of rice in rural Assam is higher than that of urban Assam in all the subsequent years. This leads to higher PDS purchase of rice in rural Assam on the average in relation to that of urban Assam. Naturally the rural-urban mean difference in respect of per capita purchase of rice is found to be statistically highly significant as depicted from Table 5.10. The data provided in Table 5.19 further helped to identify Assam as a reviving state regarding the purchase of PDS

rice in the rural context while the picture of urban Assam on this front is a languishing one.

Table 5.20 Per Capita Purchase of Wheat in Assam (kg/month): A Rural-Urban Comparison

Years	Per capita Purchase of Wheat	
	Rural Assam	Urban Assam
1999-2000	No purchase	No purchase
2001-02	No purchase	No purchase
2004-05	No purchase	No purchase
2006-07	0.01	0.02
2007-08	0.02	0.01

Source: Data on per capita purchase of wheat in rural and urban Assam is taken from Khera (2011)

Table 5.20 shows that there is no rural-urban difference in respect of per capita purchase of wheat in Assam during 1999-2000 to 2007-08. The first three years of the reference period have experienced no purchase of PDS wheat in rural as well as in urban Assam. Though some purchase of PDS wheat takes place in the last two years, but it is very negligible. Based on Khera's frame work (2011), Assam, thus, could be designated as languishing state on the matter of purchase of PDS wheat in rural as well as in urban context. Less dietary preference for wheat could be the reason for such scenario in Assam.

5.3.2 Status of Assam in relation to the rest of India regarding Diversion of Food Grain:

This section analyses the relative status of Assam in respect of diversion of food grain in relation to the rest of India. The study period covers from 1993-1994 to 2009-10.

Table 5.21 Diversion of Rice in Assam in comparison to the rest of India (in %)

States	1993-1994	1999-2000	2001-02	2004-05	2006-07	2007-08	2009-10
Andhra Pradesh	13.8	15.2	12.3	22.3	16.1	19.2	9.7
Assam	66.8	54.7	69.4	83.5	72.4	73	60.3
Bihar	79.3	94.6	77.3	84.8	83.6	92.4	71.7
Chhattisgarh	NA	NA	45.8	45.1	28.9	-3.1	-44.9
Gujrat	-1.6	-23.9	35.6	52.7	66.1	73	42.4
Haryana	52.9	0	0	0	39.5	61.8	0
Jharkhand	NA	NA	71.5	82.3	86.4	83.3	40.6
Karnataka	19.3	17.1	47	25.8	32.6	42.2	21.7
Kerala	5.8	-44.7	-28.6	-1.9	0.8	3.5	19.3
Madhya Pradesh	11.1	59.3	50.8	12.9	52.8	20.8	-26.4
Maharashtra	28	24.4	40	46.5	44.6	40.7	36.6
Orissa	76.1	26.8	21.4	74.1	53.4	46.2	14.6
Punjab	54.4	100	92.5	100	71.9	17.6	0
Rajasthan	33.1	100	76.1	100	69.8	75.7	0
Tamil Nadu	-43.1	-12.3	-79.2	9.4	2.4	8.7	3.7
Uttar Pradesh	5	46.6	77.4	85.4	72.3	52.9	39.9
West Bengal	62.3	23.8	42.4	70.4	72.4	70.8	55.6
All India Figure	27.25	28.33	38.34	52.55	50.94	45.81	20.28

Source: Data on diversion of rice from 1999-2000 to 2007-08 is taken from Khera (2011) and data on diversion of rice for the cross sections 1993-94 and 2009-10 is taken from Kumar et al (2012); Note: Negative diversion figures for some states indicate that more rice is bought than supplied through off take from central pool.

The relative status of Assam in comparison to the national level in respect of diversion of rice is very disappointing. This is evidenced from the fact that the diversion figures of rice in Assam incorporated in Table 5.21 and these found to be much higher from the national average. The performance of Assam regarding diversion of rice is found to be better in relation to Bihar and Orissa only during the year 1993-94. Apart from Bihar states like Madhya Pradesh, Punjab and Rajasthan have recorded higher diversion figures of rice in 1999-2000 as compared to that of Assam. The performance of Assam in this regard is better than Bihar, Jharkhand, Uttar Pradesh Punjab and Rajasthan in 2001-02. The same situation is observed in the year 2004-05 also, with the only exception that Jharkhand has marginally done better in comparison to Assam. In 2006-07, Assam has performed better than two states only viz. Bihar and Jharkhand, while it involves in a tie with West Bengal. In 2007-08, lower diversion of rice in Assam is observed only in relation to Bihar and Rajasthan. However, in the last

year of the reference period, Assam's position regarding extent of rice diverted is found better than that of Bihar only. Thus analysis of Table 5.21 shows that the extent of rice diverted from PDS in Assam is much higher than national average and Assam's position in relation to most of the states in this regard is very poor.

Table 5.22 Diversion of Wheat in Assam in comparison to the rest of India (in %)

States	1993-94	1999-2000	2001-02	2004-05	2006-07	2007-08	2009-10
Andhra Pradesh	-85.2	14.4	-210.8	93	66.9	50.3	9.9
Assam	83.2	100	100	100	98.4	97.5	66.5
Bihar	97.6	75.2	91.6	92.8	84.4	85.1	70
Chhattisgarh	NA	NA	33.4	82.6	65.3	57	-33
Gujrat	88.2	8.2	27.3	51.3	39.6	53.3	48.5
Haryana	99.4	0	94	82.7	29.4	48.8	35.5
Jharkhand	NA	NA	83	87.9	80.9	85.2	41.7
Karnataka	88.9	21	53.7	41.7	34.4	33.4	20.8
Kerala	96.4	5.9	66.9	78.9	55.3	55.6	24.4
Madhya Pradesh	80.1	18.2	46.4	56.7	64	39.9	43.7
Maharashtra	87.8	33.3	53.2	51	38.5	44.1	39.1
Orissa	93.9	87.5	0	99	91.5	97.1	27.4
Punjab	96.9	-107	87.7	93.1	81.1	18.4	65
Rajasthan	99.9	53	75.8	93.9	83.5	82	65.7
Tamil Nadu	98.1	-21.7	0	-86.7	-105.6	-186.1	0.5
Uttar Pradesh	90.7	17.4	67.1	36.7	7.8	-14.5	57.9
West Bengal	92.7	70.9	84	85	80.4	77.9	68.7
All India Figure	71.09	22.14	44.31	67.04	52.69	42.65	38.37

Source: Data on diversion of wheat from 1999-2000 to 2007-08 is taken from Khera (2011) and data on diversion of wheat for the cross sections 1993-94 and 2009-10 is taken from Kumar et al (2012)

It is observed from Table 5.22 that the diversion figures of wheat are much higher than the national average in almost all the years with little exception in the year 1993-94 where the gap with national diversion figure is small. In fact during 1993-94, only Madhya Pradesh has performed better than Assam in respect of wheat diversion. However, during 1999-2000 to 2007-08, Assam could not be able to compete with a single state in this regard by any means. Things have got improved little bit in 2009-10

with a decline of diversion rate. Assam has also surpassed Bihar and West Bengal in terms of relatively lower diversion of wheat in 2009-10.

Table 5.23 Diversion of Rice and Wheat from PDS in Assam (in %): A Comparison

Year	Diversion of Rice	Diversion of wheat
1993-94	13.8	83.2
1999-00	54.7	100
2001-02	69.4	98.1
2004-05	83.5	100
2006-07	72.4	98.4
2007-08	73	97.5
2009-10	9.7	66.5
Mean diversion	41.83	91.10
Standard deviation	29.96	12.68
Pearson's correlation coefficient	$r = 0.89^*$	

Source: Khera (2011) and Kumar et al (2012); figures of descriptive statistics are calculated by the Researcher; Note: * means significant at 1 % level of significance

Table 5.23 shows that diversion of wheat from PDS is more than that of rice in Assam. This implies relatively higher incidence of corruption associated with PDS wheat. In case of diversion of PDS rice, the variations over time are quite high as indicated by the value of standard deviation in Table 5.23. Unsurprisingly the variations in the amount of diversion of PDS wheat are low as not much of changes have taken place in the amount of wheat diverted from PDS over the years. One encouraging thing noticeable from Table 5.23 is that diversion of rice has declined by huge margin in 2009-10 as compared to its preceding years. Table 5.23 also shows the signs of improvement in respect of diversion of wheat in the recent year. The association between diversion of rice and wheat in Assam is found positive and statistically very highly significant. This

means that leakages from PDS in case of rice and wheat are increasing simultaneously at a great speed.

Table 5.24 Per Capita Purchase (kg/month) and Diversion of Rice and Wheat from PDS (in %) in Assam: A Combined Picture

Year	Rice		Wheat	
	Per capita PDS Purchase	Diversion from PDS	Per capita PDS Purchase	Diversion from PDS
1999-00	0.71	54.7	0	100
2001-02	0.6	69.4	0	98.1
2004-05	0.48	83.5	0	100
2006-07	1.11	72.4	0.01	98.4
2007-08	1.01	73	0.02	97.5
Pearson's correlation coefficient	-0.12***		-0.73*	

Source: Khera (2011); Value of Pearson's correlation coefficient is calculated by the Researcher; Note: * and *** mean significant at 1 and 10 per cent level of significance

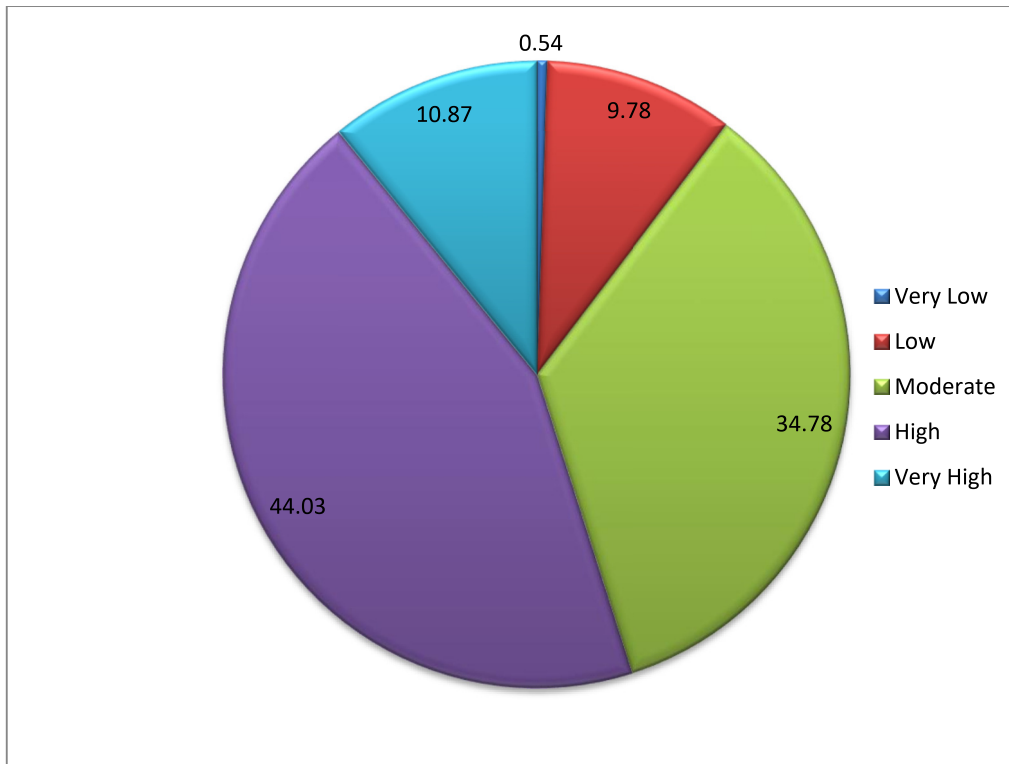
The data incorporated in Table 5.24 depicts that during 1999-2000 to 2007-08 diversion figures for both rice and wheat are on the verge of rising in Assam. As far as per capita purchase of PDS rice is concerned, there is a mark of improvement in recent years in relation to that of wheat. The per capita purchase of rice and leakages of rice from PDS have a negative and significant association meaning purchase and leakage of PDS rice are moving in the opposite direction. The same sort of association is found in case of purchase and leakage of PDS wheat. The combined analysis of per capita PDS purchase and diversion from PDS in line with the criteria developed by the present study in Table 3.5 of Chapter 3 indicates that the performance of PDS in distributing rice among households is poor while that in case of wheat is very poor.

5.4 Analysis on the Fourth Objective:

The status of household food security in rural Assam is analysed in terms of the values of Household Food Security Index (HFSI). Since it is not possible to show the HFSI

values for all the sample households in a single page, we have categorised the sample households into different levels of household food security on the basis of the criteria developed in Table 3.9 of Chapter 3. This categorisation is then represented in terms of pie charts in Figures 5.7 to 5.9. It is to be noted that in the first instance, the overall picture of household food security in rural Assam is presented in terms of Figure 5.7. Secondly, the status of household food security in Digarugaon and Irongmara are presented separately in Figure 5.8 and Figure 5.9.

Figure 5.7 Distribution of the Households in Rural Assam with regard to the level of Food Security (in %)

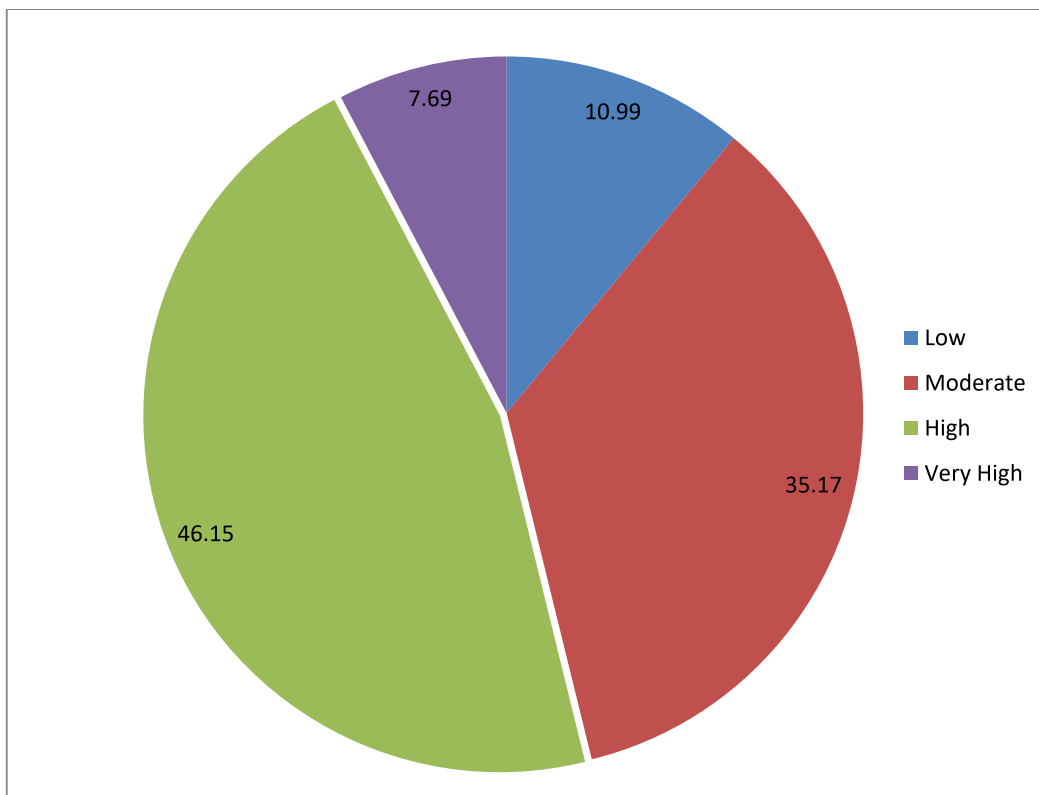


Source: Drawn by the researcher based on the calculated value as mentioned in Table 3.6 of Chapter 3 and the values of HFSI for rural Assam

The pie chart in Figure 5.7 indicates a positive picture in rural Assam as far as the status of household food security is concerned. It is visible from the chart that majority

of the households are in the group of moderate and high level food security. To be precise 34.78 per cent households have achieved moderate level of food security, while 44.03 per cent households are found highly food secure. As far as very highly food secure households are concerned, 10.87 percent of the total households constitute this category. Households with low and very low level food security are found very less in percentages in the study area. To be precise, only 9.78 percent households have achieved low level of food security whereas the percentage of households with very low level of food security is below 1 percent.

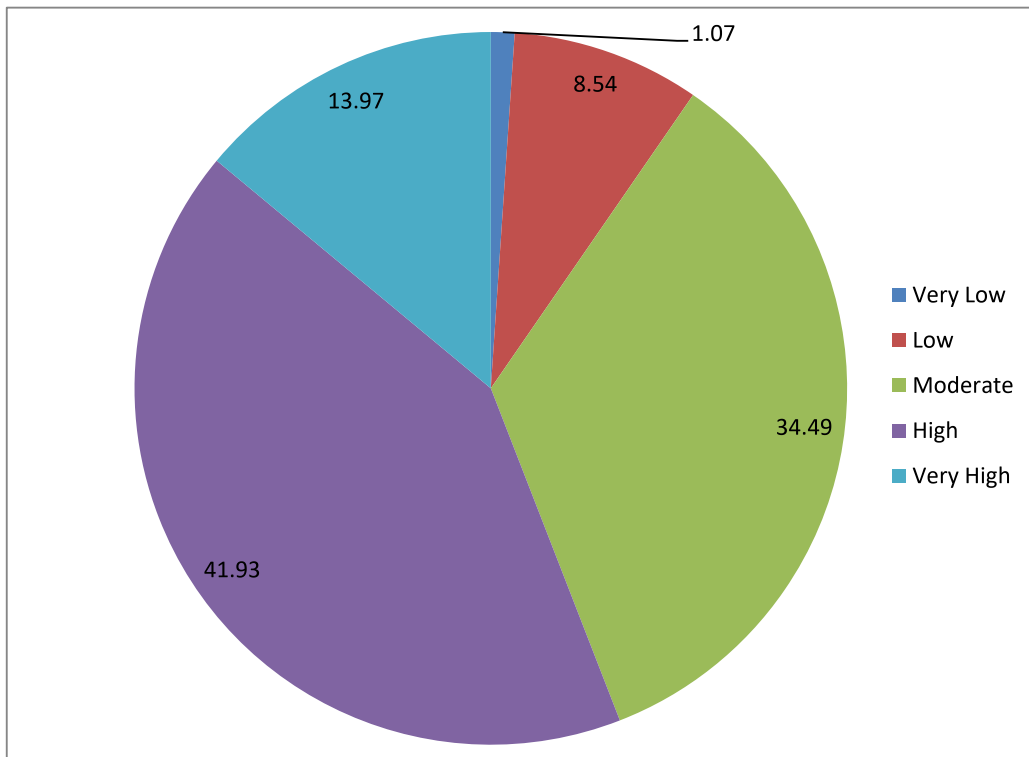
Figure 5.8 Distribution of the Households in Digarugaon with regard to the level of Food Security (in %)



Source: Drawn by the researcher based on the calculated value as mentioned in Table 3.6 of Chapter 3 and the values of HFSI for Digarugaon

To get a comparative picture of household level food security, we have incorporated the status of the same in Digarugaon and Irongmara in terms of two pie charts as 5.8 and 5.9 respectively. The pie chart in Figure 5.8 depicts somewhat a sparkling picture of food security at household level in Digarugaon. This sparkling picture is reflected in terms of the higher proportion of households with moderate and high level of food security. More specifically, if we combine the percentages of households with moderate, high and very high level of food security, it is seen that 89.1 percent households are in the midst of somewhat a comfort zone so far as the status of food security is concerned. It is only about the rest 10.99 per cent households who are found to be associated with the category of low level of food security.

Figure 5.9 Distribution of the Households in Irongmara with regard to the level of Food Security (in %)



Source: Drawn by the researcher based on the calculated value as mentioned in Table 3.6 of Chapter 3 and the values of HFSI for Irongmara

The pie chart in Figure 5.9 represents that the status of food security at household level in Irongmara is also very bright. It is visible from the Figure 5.9 that less than 10 per cent households in Irongmara belong to lower levels of food security. The percentage of households in the category of highly food secure and moderately food secure group are found as 41.93 percent and 34.49 percent respectively. A total of 13.97 percent households have attained very high level of food security in Irongmara which is slightly greater than the percentages of the households with very high level of food security in Digarugaon. So far as the moderate level of food security is concerned, comparison between pie charts of Figure 5.8 and 5.9 indicates that both Digarugaon and Irongmara are experiencing the same status. However in case of high level of household food security, Digarugaon has little edge over Irongmara.

Table 5.25 Descriptive Statistics of HFSI and Mean Difference of HFSI between Digarugaon and Irongmara

Location	Range	Mean	Standard Deviation	Mean Difference of HFSI
Digarugaon	0.80	0.61	0.17	$t = 0.9085$
Irongmara	0.90	0.63	0.18	
Rural Assam	0.84	0.62	0.18	

Source: Calculated by the Researcher

Table 5.25 shows that the values of range are quite high in case of rural Assam and also for Digarugaon and Irongmara, when we analyse the situation for these two places separately. This means that the inequality regarding food security in case of two extreme households is very high. The mean value of HFSI for rural Assam indicates that the status of rural Assam, on the average, in respect of household level food security is high only by a negligible margin. This is evidenced from the fact that HFSI with the value lying between 0.61 and 0.80 provides the recognition of high level of

food security to a household as shown in Table 3.9 of Chapter 3. The status of household level food security in Digarugaon and Irongmara are more or less same. This is reflected from the insignificant t value given in Table 5.25 which exerts that there is no significant difference in the level of household level food security between Digarugaon and Irongmara. The inter-household variations in the level of food security are found more or less equal in rural Assam as well as in case of Digarugaon and Irongmara.

5.4.1 Association between various Dimensional Indices of Household Level Food Security:

This section shows the nature and strength of the relationship between various dimensional indices of food security at household level in terms of Karl Pearson's Correlation Coefficient.

Table 5.26 Pearson's Correlation Coefficient between various Dimensions of Household level Food Security

Dimensions	Food Availability Index	Food Accessibility Index	Food Absorption Index
Food Availability Index	1	0.64*	0.17**
Food Accessibility Index	0.64*	1	0.20**
Food Absorption Index	0.17**	0.20**	1

Source: Calculated by the Researcher

Note: * and ** indicate significant at 1 and 5 per cent level of significance

The figures in Table 5.26 show that there is a positive and strong association between availability and accessibility of food. The relationship is also found to be statistically significant at 1 percent level of significance. The association between availability and absorption of food though is found positive and statistically significant at 5 percent

level of significance, the association is not very strong as the value of r is very low. Similarly the relationship between accessibility and absorption of food is also weak as evidenced by the low value of r in Table 5.26.

The analysis of the district level secondary data shows that the association between food availability and food accessibility is weak while that between availability and absorption of food is strong and between accessibility and absorption of food is moderate. However the nature of association between various dimensions of food security at household level is totally in contrast with that at district level in rural Assam. At household level it is seen that availability and accessibility of food is strongly correlated while the association in respect of other two cases are very weak. Thus although the direction of association between various dimensions of food security is found similar at district as well as at household level, the line of demarcation arises in respect of the strength of such association.

5.4.2 Determinants of Household level Food Security in Rural Assam:

The estimation of the regression model gives the result that assets, education level of the head of the household, female headed household, households with non-agricultural occupation and households with both agricultural and non-agricultural occupation have significant impact upon household level food security. The model is also found to be overall significant and possessing high value of adjusted R^2 . However after conducting the diagnostic tests, it is found that although the model is free from multicollinearity⁸, it seriously suffers from the problem of heteroskedasticity⁹. Hence

⁸It means the existence of perfect and higher linear relationship among the explanatory variables. For a detailed discussion see Gujarati, D.N (2004)

⁹ It means unequal variance of random disturbance terms. For a detailed discussion see Gujarati, D.N (2004)

Breusch-Pagan/Cook-Weisberg test (1979) is used to correct heteroskedasticity problem. The results of the final estimated regression model after correcting the problem of heteroskedasticity are incorporated in Table 5.27 given below. It is to be noted that the correction of heteroskedasticity in the previous model makes female headed household insignificant.

Table 5.27 Regression Results

F (8,175) = 50.52*

Adjusted R² = 0.7034

ln ($\frac{1}{1-y}$)	Robust		t	P> t	[95% Conf. Interval]	
	Coefficient	Std Error				
Asset index	2.025*	0.273	7.39	0.000	1.484	2.565
Dependencyratio	-0.038	0.171	-0.22	0.824	-0.377	0.300
Age of the HH	-0.001	0.002	-0.25	0.800	-0.006	0.004
Education of HH	0.128*	0.012	10.72	0.000	0.104	0.152
Sex of the HH	0.139	0.092	1.51	0.132	-0.042	0.321
Social Group	0.020	0.071	0.28	0.776	-0.120	0.161
Non-agriculture	0.156***	0.092	1.70	0.092	-0.025	0.337
Agr+non-agriculture	0.189***	0.103	1.84	0.068	-0.014	0.393
_cons	-1.167*	0.212	-5.50	0.000	-1.586	-0.748

Source: Calculated by the Researcher based on the primary data collected during field survey

Note: * and *** means significant at 1 per cent and 10 per cent level of significance

The result of estimated regression equation as in Table 5.27 shows that the value of adjusted R² is 0.7034 which implies a good fit of the model. The value of F statistics is also highly significant and thus representing the overall strength of the model in explaining the variation in the level of household food security in rural

Assam. So far as the individual explanatory variables are concerned, asset holding of the households is found to be positively and significantly influencing food security at household level. This implies that an increase in household's asset is a good indication of the rise in its purchasing power and thus has a positive effect upon enhancing the level of food security. Education level of the head of the household is also found highly statistically significant on raising the status of household food security. This means that higher the level of education of household's head, the higher is the chance of incorporating the value of education in the household, which not only raises the scope of education of other family members but also provides valuable nutritional and sanitation inputs. Thus it has indirectly help to increase the accessibility and absorption aspects of food security. So far as the impact of occupation is concerned, it is found that households with non-agricultural activities and households with a mix of agricultural and non-agricultural activities are more food secure in relation to those households whose main occupation is only agriculture or other allied activities. This finding indicates that mere dependence on agriculture may not be sufficient for ensuring a high level of food security at household level. The insignificant results about other explanatory variables imply that social group, female headed households, experience of the head of the household and household's dependency ratio do not have any significant influence upon the level of household food security in rural Assam.

5.5 Conclusion:

The findings of this chapter show that the status of food security in rural Assam is below national average. The inter-district analysis in rural Assam indicates that majority of the districts are moderately food secure. With regard to the role of PDS in

addressing the issue of food security, it is found that although Assam has emerged as a reviving state in case of purchase of PDS rice in recent years in the rural context, leakages from PDS in case of rice and wheat have increased simultaneously at a great speed. The status of rural Assam, on the average, in respect of household level food security is found high only by a negligible margin. Assets, education level of the head of the household, households with non-agricultural occupation and households with both agricultural and non-agricultural occupation are found to have significant impact upon household level food security in rural Assam.

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