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## Micro Level Analysis of Food Security and Agricultural Development: A Case Study

Rukhsana<sup>1</sup>, Asraful Alam\*<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Geography, Aliah University, Kolkata 700091, West Bengal, India

<sup>2</sup>Ph.D. Research Scholar, Department of Geography, Aliah University, Kolkata 700091, West Bengal, India

\*Corresponding Author E-mail: [alam5asraful@gmail.com](mailto:alam5asraful@gmail.com)

Received: 02 April 2013, Revised: 05 May 2013, Accepted: 15 June 2013

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### ABSTRACT

The present paper attempts to analysis the food security and agricultural development in Kurshamari Gram Panchayet. Food security is mainly comprised of three components- food availability, access and stability. The agricultural development depends upon its package approach. Irrigation, fertilizer, type of farming, size of landholding, employment structures are the main components. The study area has been chosen as the micro unit of analysis. Village wise seven indicators of food security and four indicators of agricultural development have been computed to illustrate the relationship between food security and agricultural development. The results presented here rely on data collected from a random sample of 160 household in the study area, using well-structured questionnaire. It have been find out that agricultural development is high in the village of Satgram but food security is low, on the other hand agricultural development is low but food security is moderated, because occupation structure is positively related with food security.

**Keywords:** Food Security, Agricultural Development.

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### Introduction

Food security is defined as “access by all people at all times to enough food needed for an active and healthy life. It is essential elements are the availability of food and the ability to acquire it” (Reutlinger, 1985). The term food security for the first time was used in the World- Food Conference held at Rome in 1974, organised by FAO (Food and Agricultural Organisation). Food security as a global issue has been defined in a number of ways. It is to be

interpreted as means for adequate availability of food items, particularly food grains. It also refers to the adequate purchasing power to meet the food requirement at household level (Sankar, A.N., 2001). Tween, L.G., et al., (1997) noted that food security is comprised of three components- food availability, access, utilization. The food availability is reducing mainly due to the transformation of cereal crop cultivation into commercial

crop. Food stability may reduce due to changing land use pattern associated with industrialization, commercialization and globalization. But food accessibility merely depends on purchasing power of inhabitants (Rukhsana, 2010). Improving food security at the global, national, regional, individual and household level is an issue of great importance for developing countries like India, where millions of poor suffer from persistence hunger and malnutrition and others are at risk of doing so in the future. (Maxwell and Frankenberger 1992) identified many definitions for the concept of food security. However, all definitions emphasis development from macro-level to micro-level concern; from adequate level of supply towards concern to meet the demand; and from short term to a concern of long term (permanent). Macro-level food self-sufficiency does not assure the achievement of food security at household level. According to FAO there are two levels of food insecurity, macro-level (food supply insecurity) and micro-level (food consumption insecurity) (FAO 1996). Food supply insecurity is the national aggregate insecurity which arises when a country is unable to supply its aggregate food requirement either through domestic food production, imports or run-down of stocks and reserves. On the other hand, food consumption insecurity exists when certain individuals or groups cannot gain access to adequate food given their nominal incomes and the price and availability of food.

### Objectives

This paper conceptualizes micro regional development in terms of availability of food security and agricultural opportunity. The prime objective of this paper is to examine the association between the variables of food security and agricultural

development and to find out the spatial variation of the food security.

### Data Base and Methodology

The present work is based on both primary and secondary sources of data relating to food security and agricultural development. Kurshamari Gram Panchayat have selected for the study which include eight villages namely Satgram, Daluarpar, Mahischaru, Tetulerchara (s), Kharijaratanpur, Abasratanpur, Barakhalishamari, Kurshamari, from each village 5 percent households have been selected randomly. The total sample household is 160 and total population of the sample household is 833. Where 470 (56.42 percent) is male and 363 (43.58 percent) is female population in the study area (Table- 2).

In the present study total 11 (7 indicators for food security and 4 indicators for agricultural development) indicators have been selected to find out disparities in overall agricultural development and food security (Table- 1). Food grain availability has been calculated in grams per head per day to examine the regional aspect of surplus and deficit areas of food grains availability at village level. Caloric availability of food grains has been calculated in caloric per head per day.

In order to reach on standardization, the raw data for each indicator will be computed into standard scores. It is commonly known as z- score or standard score. The values so obtained will be added village wise and standardized scores taken out of this composite z- score which may be known as composite z score (Cs) for each village each set of indicator. Again these result will be transformed back into z- score, so that 'zero' indicates average performance and unity (+ or -) represent one standard deviation in either indicates high and low values respectively.

Thus the level of food security and agricultural development can be calculated or examined with the help of composite z-score technique, which is expressed as follows:

$$Z = \frac{X - \bar{X}}{SD}$$

Z= Standard score

X= Original Value of the Score

$\bar{X}$  = Mean of the Variables

SD= Standard deviation

The obtain Z= score of each indicator is added district wise to be known as composite Z= score (s) for each spatial unit of the study area.

$$C_s = \sum Z_{ij}$$

C<sub>s</sub> denotes composite Z scores

Z<sub>ij</sub> indicates some of Z- scores of indicators j in the village i.

**Table 1.** Selected indicator for the study

Food Security	Agricultural Development
Food availability	Employment structure
Area, production and yield	Irrigation facility
Livestock availability	Type of farming
Caloric availability	Size of landholding
Public distribution system	
Literacy rate	
Monthly income	

**Table 2.** Demographic Profile of the Study Area

Sl. No	Name of the Villages	Total No of Households	Total no. of Sample Households	Total Population	Total Sample Population	Total Sample Male	Total Sample Female
1	Satgram	422	20	2101	107	61	46
2	Daluarpar	528	20	2447	96	52	44
3	Mahischaru	677	20	3114	102	57	45
4	Tetulerchara	316	20	1425	98	58	40
5	Kharijaratanpur	88	20	347	109	59	50
6	Abasratapur	251	20	1118	104	62	42
7	Barakhalishamari	525	20	2522	105	60	45
8	Kurshamari	545	20	2508	112	61	51
	Total	3352	160	15582	833	470	363

Source: Census of India 2011, Kurshamari Gram Panchayat, West Bengal

### Study Area

Kurshamari Gram Panchayat is located in Mathabhanga Subdivision of Cooch Behar District (Lies between 25°57'47" and 26°36'20" north latitude; between 88°47'44" and 89°54'35" east longitude) of the state West Bengal. It is 40 km distance from the district headquarter by road. It

has 3352 households according to 2011 census, 15577 total population where 58.82 percent is SC (Scheduled Castes) and 41.18 percent is others population.

A household analysis of Food security

### Foodgrains Availability:

**Table 3.** Village wise distribution of foodgrains availability in study area

Sl. No	Name of the village	Foodgrains availability
1	Satgram	1490.17
2	Daluarpar	4970.03
3	Mahischaru	2000.53
4	Tetulerchara	2005.45
5	Kharijaratanpur	1727.98
6	Abasratanpur	641.36
7	Barakhalishamari	224.97
8	Kurshamari	3352.73
9	Total	2051.65

Table 3 indicates that the distribution of the foodgrains availability has been reported highest (4970.03 gram per head per day) in Daluarpar and lowest reported in Barakhalishamari villages (224.97 gram per

head per day). Daluarpar village is economically strong where productivity is high, while Barakhalishamari is economically weak village where productivity is very low.

#### Area, production and yield:

**Table 4.** Village wise distribution of foodgrains in area, production and yield

Name of the village	Area (Hectors)	Production (Quintals)	Yield (quintals/hectors)
Satgram	64.19	582.20	09.07
Daluarpar	130.74	1741.50	13.32
Mahischaru	66.22	744.80	11.25
Tetulerchara	59.12	717.35	12.13
Kharijaratanpur	68.92	687.48	09.98
Abasratanpur	32.43	243.46	07.51
Barakhalishamari	30.40	86.22	02.84
Kurshamari	120.27	1370.60	11.40
Total	71.44	771.70	09.68

Source: Field Survey, 2013

Productivity is yardstick of foodgrains production which is the backbone of agricultural development. Yield in quintals per hectors has been selected as a unit to measure productivity and stability of production. Table 4 shows that average 09.68 quintal per hectare

yield has been reported in sample villages. Highest per hectare yield is recorded in the village of Daluarpar (13.32) and lowest in Barakhalishamari (02.84).

#### Livestock Availability:

**Table 5.** Village wise distribution of livestock availability

Name of the village	Cow	Buffalos	Goat	Sheep	Hen	Total
Satgram	41.74	5.75	24.46	1.43	26.62	100
Daluarpar	38.71	00	39.19	00	22.10	100
Mahischaru	29.32	5.28	21.69	5.77	37.99	100
Tetulerchara	43.96	00	31.89	00	24.15	100
Kharijaratanpur	34.14	00	16.26	10.56	39.04	100
Abasratanpur	25.21	2.52	21.84	8.41	42.02	100
Barakhalishamari	34.43	00	9.95	7.28	48.34	100
Kurshamari	42.74	00	35.87	00	21.39	100
Total	36.28	1.69	50.28	4.18	32.70	100

Source: Field Survey, 2013

Table 5 show the village wise distribution of livestock availability. It have been reported that the highest availability goat is present in the study area (50.28 percent) which follows to cow and hen (36.28, 32.70 percent) respectively. On the other hand as village wise he highest

availability of cow (43.96), goat (39.19) and hen (48.34) have been find out in Tetulerchara, Daluarpar, Barakhalishamari respectively, which enhance the purchasing power and instable food security.

#### Caloric availability:

**Table 6:** Village Wise Distribution of Caloric Availability of the Sample Households

Name of the village	Caloric Availability (Per Head/Day)
Satgram	2073.59
Daluarpar	6202.60
Mahischaru	2652.71
Tetulerchara	2554.95
Kharijaratanpur	1883.51
Abasratanpur	867.12
Barakhalishamari	307.08
Kurshamari	4881.59

Source: Field Survey, 2013

The distribution of caloric availability of foodgrains in selected villages shown that 6202.60 calories person per day has been reported in Daluarpar, followed by 4881.59 calories person per day

Kurshamari and lowest 307.08 calories person per day in Barakhalishamari (Table 6).

#### Public distribution system:

**Table 7.** Percentage distributions of Public Distribution System in the study area

Name of the village	APL	BPL	Total
Satgram	40	60	100
Daluarpar	70	30	100
Mahischaru	85	15	100
Tetulerchara	50	50	100
Kharijaratanpur	80	20	100
Abasratanpur	60	40	100
Barakhalishamari	75	25	100
Kurshamari	80	20	100
Total	67.5	32.5	100

Source: Field Survey, 2013

Public distribution system has been counted on the basis of APL (above poverty line) and BPL (below poverty line) in sampled villages. These ration cards are different colour of cards issued by government to distribute rice, wheat, sugar, shop, detergent and kerosene at subsidize rate. This cards have been given those persons who earn less than 9000 per year they come under below poverty line (BPL) and who earn more than 9000 per

year they come under above below poverty line (APL) (FSD, 2003). The highest percentage respondent who use APL ration card is found in the village of Mahischaru (85 percent), while lowest is recorded in village of Satgram (40 percent). On the other hand of BPL user recorded in the village of Satgram (60 percent) and lowest in Mahischaru it is 15 percent. (Table- 7)

#### Literacy rate:

**Table 8.** Village Wise distributions of Literacy Rate in Percent

Name of the village	literate	illiterate	Total
Satgram	66.67	33.33	100
Daluarpar	59.13	40.87	100
Mahischaru	51.96	48.04	100
Tetulerchara	48.98	41.02	100
Kharijaratanpur	49.54	50.46	100
Abasratanpur	54.81	45.19	100
Barakhalishamari	40.95	59.05	100
Kurshamari	65.18	34.82	100
Total	54.65	45.35	100

Source: Field Survey, 2013

Table 8 focused on the distribution of literacy rate in study area of sample household. Literacy is one of the most important components of educational status. Out of total villages 54.65 percentage of literate population and 45.35 percent illiterate population have

been recorded in the study area. The literacy rate of these villages is moderated; the highest literacy rate is found in the village of Satgram (66.67 percent) and lowest in Barakhalishamari (40.95 percent).

#### Income Structure:

**Table 9:** Village wise distribution of monthly income structure of sampled household respondents

Name of the village	Income Index (in percent)			Total
	< 3000	3000- 6000	>6000	
Satgram	15	45	40	100
Daluarpar	30	35	35	100
Mahischaru	25	50	25	100
Tetulerchara	35	50	15	100
Kharijaratanpur	20	40	40	100
Abasratanpur	55	35	10	100
Barakhalishamari	40	45	15	100
Kurshamari	20	65	15	100
Total	30	45.63	24.37	100

Source: Field Survey, 2013

Table 9 shows the income structure of sample household in the study area. The monthly income of the respondent household have been categorized in to three types on the base of minimum and maximum income of rickshaw- pullers in the study area (<3000, 3000- 6000 and >6000). The maximum respondents have been find out in the study are between 3000-6000 in come group and minimum

monthly income group people reported >6000 per month in the study area. As per

the village wise, the maximum percentage of respondent who earn <3000 is found in the village of Abasratanpur (55 percent), while minimum is recorded in the village of Satgram (15 percent). Between 3000-6000, the highest percentage of respondent recorded in the village of Kurshamari (65 percent) and lowest in both Daluarpar (35 percent) and Abasratanpur (35 percent).

#### Agricultural Development

**Table 10.** Village Wise Distribution of Employment Structure in percentage

Name of the village	Cultivators	Agricultural labour	Daily Labour	Service	Business	Others	Total
Satgram	29.41	11.76	23.53	11.76	20.59	02.94	100
Daluarpar	38.71	19.35	9.67	16.13	6.45	09.68	100
Mahischaru	42.86	25.71	22.86	00	8.57	00	100
Tetulerchara	35.48	25.81	16.13	3.26	6.45	12.90	100
Kharijaratanpur	34.21	26.32	21.05	2.63	10.53	05.26	100
Abasratanpur	30	20	20	00	16.67	13.33	100
Barakhalishamari	40.43	31.91	10.64	00	2.13	10.64	100
Kurshamari	33.33	13.89	22.22	13.89	16.67	00	100

Source: Field Survey, 2013

Table 10 demonstrates the distribution of employment structure of the study area. The highest percent of cultivators, agricultural labours and livestock rearing are found in the village of Barakhalishamari. The highest numbers of daily labour, service and business have been recorded in village of Satgram (23.53), Daluarpar (16.13) and Satgram (20.59) respectively. In the village wise study highest percentage of cultivators recorded in the village of Mahischaru (42.86 percent) and lowest in Satgram (29.41). The agricultural labour is highest recorded in the village of

Barakhalishamari (31.91 percent) because highest number of marginal farmers found in this village (Table- 12) lowest percentage of agricultural labour recorded in Satgram (11.76 percent) . On the other hand maximum percentage of daily labour (23.53 percent) and business (20.59 percent) recorded in the village of Satgram and minimum daily labour in the Daluarpar (9.67 percent) and business in Barakhalishamari (2.13 percent). The highest percentage of service recorded in the village of Daluarpar (16.13).

#### Irrigation facility:

**Table 11.** Percentage distributions of Source of Irrigation in the study area:

Name of the village	Tube well(With Diesel)	Tube well(With Petrol)	Total
Satgram	31	69	100
Daluarpar	6	94	100
Mahischaru	40	60	100
Tetulerchara	30	70	100
Kharijaratanpur	42	58	100
Abasratanpur	49	51	100
Barakhalishamari	79	21	100
Kurshamari	28	72	100
Total	38.13	61.87	100

Source: Field Survey, 2013

Table 11 shows that source of irrigation where average 38.13 percent respondent household main irrigation source is tube

well with diesel and 61.87 percent tube well without diesel.

**Type of farming:**

**Table 12.** Village Wise Distribution of Type of Farming in percentage

Name of the village	Tractor Operated	Bullock Operated	Tractors/Bullock Operated	Total
Satgram	64.71	15.29	20	100
Daluarpar	68.50	12.5	19	100
Mahischaru	49.7	21.1	29.1	100
Tetulerchara	67.81	22.19	10	100
Kharijaratanpur	53.03	18.17	28.8	100
Abasratanpur	20.9	38.8	40.3	100
Barakhalishamari	29.1	41.2	29.7	100
Kurshamari	64.7	20.1	15.2	100
Total	52.31	23.67	24.02	100

Source: Field Survey, 2013

It has been evident that 52.31 percent cultivators have been using tractors to cultivate agriculture land, while 23.67 percent used bullock and 24.02 percent depend on both (tractor operated and bullock operated). In the village of

Daluarpar (68.50) highest percent respondent have been using tractor to cultivate agricultural land and low in the village of Abasratanpur where only 20.90 percent (Table- 12).

#### Size of landholdig:

**Table 13.** Village Wise Distribution of Type of Land Holding Size in percentage

Name of the village	Landless	Marginal(> 1 Hector)	Small(1 -2 Hectors)	Semi-Medium(2 -4 Hectors)	Medium(4 - 10 Hectors)	Large(<1 0 Hectors)	Total
Satgram	5	15	30	25	20	5	100
Daluarpar	5	20	25	15	25	10	100
Mahischaru	10	30	20	10	20	10	100
Tetulerchara	5	20	30	20	20	5	100
Kharijaratanpur	10	30	10	30	10	10	100
Abasratanpur	10	30	25	15	15	5	100
Barakhalishamari	15	40	25	15	5	0	100
Kurshamari	5	20	25	5	30	15	100
Total	8.12	25.63	23.75	16.87	18.13	7.5	100

Source: Field Survey, 2013

In agricultural systems size of land holdings determines the agricultural income of farmers. It is evident from table 13 that the size of land holdings of the respondents have been arranged into five categories i.e., land less, marginal (less than 1 hectare), small (1-2 hectare), semi medium (2-4 hectare), medium (4-10

hectare) and large (above 10 hectare). Of the total cultivators, maximum of the respondent have marginal and small size of land holdings. Of the total respondents in Barakhalishamari 15 percent respondents have no land they are land less. A large size of land holding is reported in Kurshamari (15 per cent).



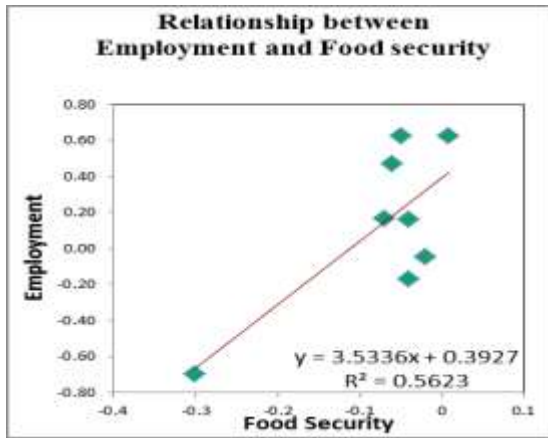


Figure 1

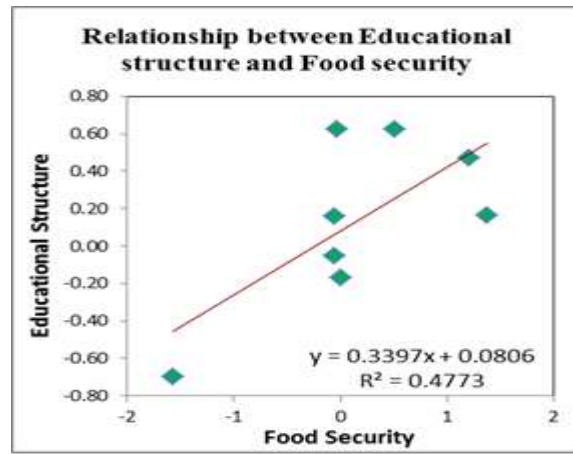


Figure 2

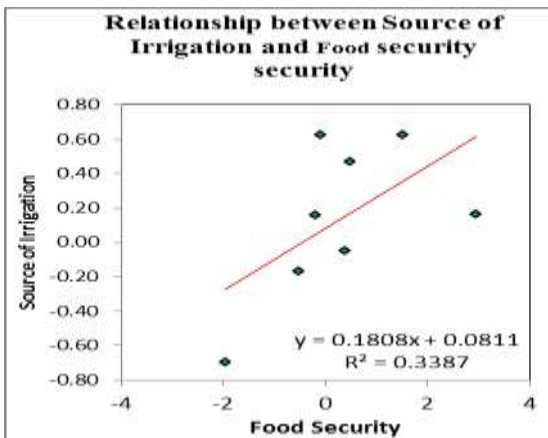


Figure 3

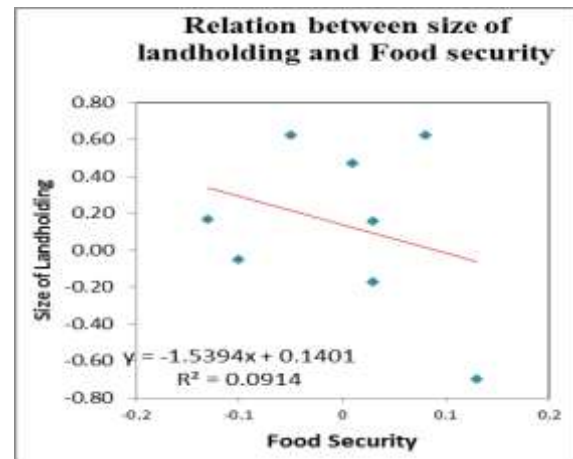


Figure 4

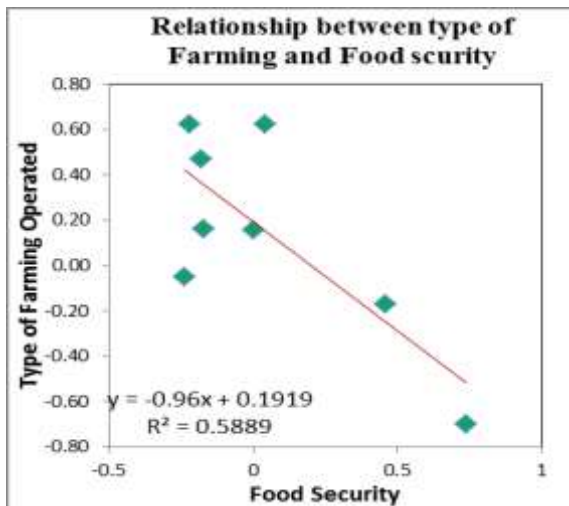


Figure 5

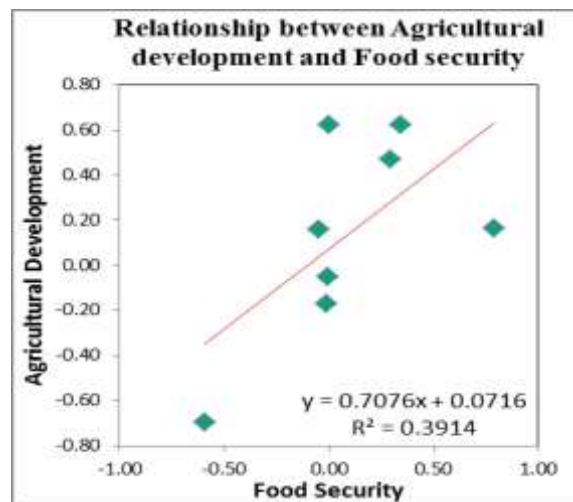


Figure 6

Finally to find out the relationship between the variables of agricultural development and food

security, an effort has been made work out on the basis of co-efficient of determination ( $R^2$ ).

It has been concluded through the figure-1, figure-2 and figure-3 reveals that the employment, educational structure and source of irrigation is positively related with food security ( $R^2 = 0.562$ ,  $R^2 = 0.477$  and  $R^2 = 0.338$  respectively). But on the other hand figure-4, figure-5 shows that size of landholding and type of farming operation is negatively related with food security ( $R^2 = 0.091$ , ( $R^2 = 0.588$  respectively). In this study area the maximum percentage of cultivators of Barakhalishamari and Abasratapur have been using bullock to cultivate agriculture land (Table No. 12) for this causes their production is also very low. Figure 4 shows that negative relationship between landholding size and food security because in this study area maximum farmers are marginal and landholding size of the large numbers of farmers of the village like Abasratapur, Barakhalishamari, Tetulerchara have semi- medium (2-4 Hectors) but their maximum lands are fellow not use for agricultural purposes (Table no 13). Some of the villages like Satgram, Kharijaratanpur (Table no 4) have landholdig size is large but their yield is low because labour productivity is low (Labour productivity = Total agricultural product of a year/ Total no of labour force in that year). After going through the above analyses it has been observed that agricultural facilities like source of irrigation, size of landholding, type of farming operated, educational facility etc. are found high in Satgram, Daluarpar and Kurshamari villages on the other hand low in the villages of Abasratapur, Barakhalishamari and Kharijaratanpur. It is evident that Daluarpar and Kurshamari are

highest in food security. Agricultural development is high in the village of Satgram but food security is low, on the other hand agricultural development is low but food security is moderated, because occupation structure is positively related with food security. In Satgram (Table No. 10) minimum percent of population engaged in agricultural activity (Cultivators, Agricultural labour). So, food security is found high in those areas which are highly developed in agriculture and foodgrains production.

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**How to cite this article:** Rukhsana, Asraful Alam, Micro Level Analysis of Food Security and Agricultural Development: A Case Study. *International Journal of Advanced Studies in Humanities and Social Science*, 2013, 2(3), 149-158. [http://www.ijashssjournal.com/article\\_83464.html](http://www.ijashssjournal.com/article_83464.html)