



Linking Food Security and Agricultural Development in Koch Bihar District, West Bengal

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Abstract: Food security which is most important contexts and burning issues now a days, as now human being have enough production as well as man power, knowledge and skill but at the same point many people lead their life with low quality of food and calorie. Agricultural development denotes the quality of agricultural system of a region. Agriculture plays a dual role in the abolition of hunger. The specific objective has been selected for the study which is to find out the relationship between agricultural development and food security and affecting factors of agricultural development and food security in the study area. Present study is mainly based on secondary sources of data and Koch Bihar district has been selected as a study area. This geographical analysis light up the socio-economic and political reason behind the changes in agricultural land use pattern. It may be conclude from the above analysis that agricultural developments have positive impact on food security in the study area. Agricultural developments have increased our production of crops which help to reduce our food deficiency means increase per capital availability of food crops.

Key Words: *Agricultural developments, Food security, Production and Relationship*

Introduction: Food security which is most important contexts and burning issues now a days, as now human being have enough production as well as man power, knowledge and skill but at the same point many people lead their life with low quality of food and calorie. If we properly distributed our enough technology, knowledge and production in every corner with the help of science and think about our prospect on future generation then food will be secured. Food security is a global issue, which come ahead in the time of 1970s. The term food security became well-known after the World-Food Conference held at Rome in 1974. Food security simply defines the absence of hunger or to provide sufficient amount of food at the global, national, community or household level (Anderson, 2009). In other words food security exists when “no child, woman and man should go to the bed hungry and no human being’s physical and mental capabilities should be stunted by malnutrition” (Acharya, 1983). Food security means perennial availability of the sufficient quantity and quality of food to each and every person of an area. Food security has two dimensions: the physical availability of food, and the capacity of people to pay for the food they need.

On the other hand access by all people, at all times, to enough food for an active, healthy life and includes at a minimum: a) the ready availability of nutritionally adequate and safe foods and b) the assured ability to acquire acceptable food in socially acceptable ways e.g., without resorting to emergency food supplies, scavenging, stealing, and other coping strategies (Life Sciences Research Office, Federation of American Societies for Experimental Biology, 1990). Food security is achieved “when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO 1996). To achieve such a situation requires concerted action at individual, household, national, regional, and global levels (FAO 1996).

Foundation of food security is built on four pillars. These are i) Food Availability ii) Food Accessibility iii) Food Utilization iv) Food Stability. Food availability is defined as the sufficient quantities of food of appropriate quality, supplied through household production, other domestic output, and commercial inputs imports, including food assistance to all individuals within a country or a spatial unit. Food access is ensured when all households and individuals have enough resources to obtain food in sufficient quantity, quality and diversity for a nutritious diet. This depends mainly on the amount of household resources and on the income available to the household, on the distribution of income within the household and on the price of foods. In addition, accessibility is also a question of the physical, social and policy environment. Food utilization is the proper biological use of food, requiring a diet providing sufficient energy and essential nutritious potable water knowledge, habits and adequate sanitation. It mainly depends on the managing knowledge of food, proper utilization of food, food processing technique, basic principal of nutrition, proper child care and health management. To be food secure, a population, household or individual must have access to adequate food in all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security (FAO, 2006).

Agricultural development denotes the quality of agricultural system of a region. Agriculture plays a dual role in the abolition of hunger; it produces the food and it can also create an opportunity for number of jobs needed by the households to buy food. Raising production and productivity in this sector can immediately place additional purchasing power in the hands of the rural poor, who will in turn, utilized the additional income for purchasing more food, clothing and other basic consumer goods that will create more jobs and higher incomes for countless others (Jagdish Singh, 2004). Agricultural development is unquestionably a multi-dimensional concept, of which crop production, crop-diversification and commercialization of agriculture are the main components. In the Koch Bihar district out of a total geographical area of 3.387 lakh hectares where 2.46 lakh hectares is net cropped area and irrigated land accounts for 106.00 thousand hectares. The major crop is rain fed paddy out of which

Paddy occupies 60% area. About 12% is covered by Tobacco, Jute followed by vegetables (8.54%) and Mustard (7.55%). Remaining land is occupied by Potato, Wheat and other crops. Paddy is also grown before and after the rainy season.

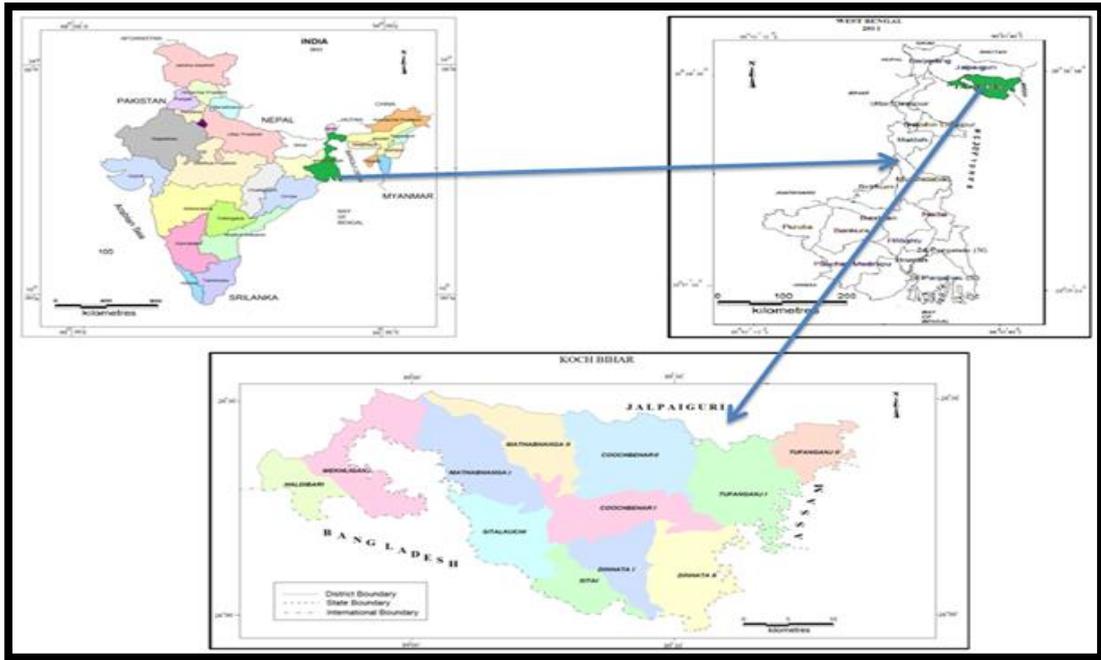
Agriculture and food security are linked in many ways. Investments in agriculture are important to increase food security. Rising productivity increases incomes of rural people and lowers food prices, making food more accessible to the poor. Other investments like improved irrigation facility and drought tolerant crops, reduce price and income variability by mitigating the impact of a drought. Productivity gains are keys to food security in countries with foreign exchange shortage or limited infrastructure to import food. The same applies to households with poor access to food markets. Agriculture will continue to play a central role in tackling the problem of food insecurity. It can maintain and increase global food production, ensuring food availability. It can be the primary means to generate income for the poor, securing their access to food. And through new and improved crop varieties, it can improve diet quality and diversity and foster the link between food security and nutrition security. The contributions that agriculture makes to food security need to be accompanied by various programs to raise incomes of the poor, as well as insurance and safety nets, including food aid, to protect the chronic and transitory poor. In this paper, the relationship between food security and agricultural development has been discussed intensely.

Objectives

The specific objective has been selected for the study which is to find out the relationship between agricultural development and food security and affecting factors of agricultural development and food security in the study area.

Study Area

The Koch Bihar district of West Bengal, which is selected for study has been seen as under developed and it is perpetually dependent for its food but other requirements are fulfilled from other parts of the state and country. The district lies between 25°57'40" and 26°32'20" North latitude and between 88°47'40" and 89°54'35" East longitude. The district is surrounded by Jalpailguri District in the North, Goalpara District of Assam and Rangpur district of Bangladesh in the East and International Boundary of Bangladesh in South & West. The food grains availability is high as compare to the whole country but the availability of other cereals is not satisfactory. There are number of constrains resting the crop productivity in the district.



Data Base and Methodology

Present study is mainly based on secondary sources of data which are collected from census report and various other departments like Cooch Behar District Statistical Hand Book, Bureau of Applied Economics and Statistics, Government of West Bengal. The study is based on secondary data. Data of literature have been collected from various books, journal, and articles from Libraries of Indian Agricultural Research Institute (IARI), New Delhi; Jawaharlal Nehru University, New Delhi; Bihdan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal; Delhi University, Delhi; ICSSR, New Delhi and Maulana Azad Library, A.M.U., Aligarh, NASDOC, ICSSR, New Delhi. Secondary data collected from various published and unpublished records of the Government and Non-Government Organizations. Agriculture data have been collected for the years of 2001- 2002 and 2011-2012 from Ministry of Agriculture, Department of Statistics and Economics, Kolkata, Burrow of Applied Statistics and economics, Kolkata and Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India. In combination with food security and agricultural development of Koch Bihar district three categories have been made namely high, medium and low. The index has been designed in accordance with standard deviation (SD-1 and SD+1) of composite z scores.

In order to reach on standardization, the raw data for each indicator have been computed into standard scores or Z score. In the first step block wise z-score for each indicator is calculated (Smith, 1973). The values so obtained are added block wise and standardized scores taken out of this composite z-score which may be known as composite z-score (Cs) for each block and each set of indicator like food availability, food accessibility region. Again these results have been 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 regional patterns of food security have been examined with the help of composite z-score technique, which is expressed as follows:

$$z = \frac{X - \bar{X}}{\delta}$$

Z= Standard score, X=Original Values of the score, \bar{X} = Mean of variables, δ = Standard deviation of variables, the obtained Z=score of each indicator is added district wise and block wise to be known as composite Z=score(s) for each spatial unit of the study area. Finally $C_s = \frac{\sum Z_{ij}}{N}$

C_s denotes composite Z-scores, Z_{ij} indicates the sum of Z-scores of indicators j in blocks i and N is symbolize the number of variables.

The correlation coefficient is worked out among dependent variable (Food Security) and independent variables (selected variables of the factors affecting to the food security) and student t-test technique is applied to find out the determinants which are significant at 1 per cent and 5 per cent levels. The correlation co-efficient has been computed on the basis of the Karl Pearson's correlation co-efficient (r) method which is as follows:

$$r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{N}} \sqrt{\sum y^2 - \frac{(\sum y)^2}{N}}}$$

Where, r is the co-efficient of

correlation, x, y are the two given variables, n is the number of observation. To find out the computed 't' value, student t-test technique is used which is given below:

$$t = r \sqrt{\frac{(n-2)}{1-r^2}}$$

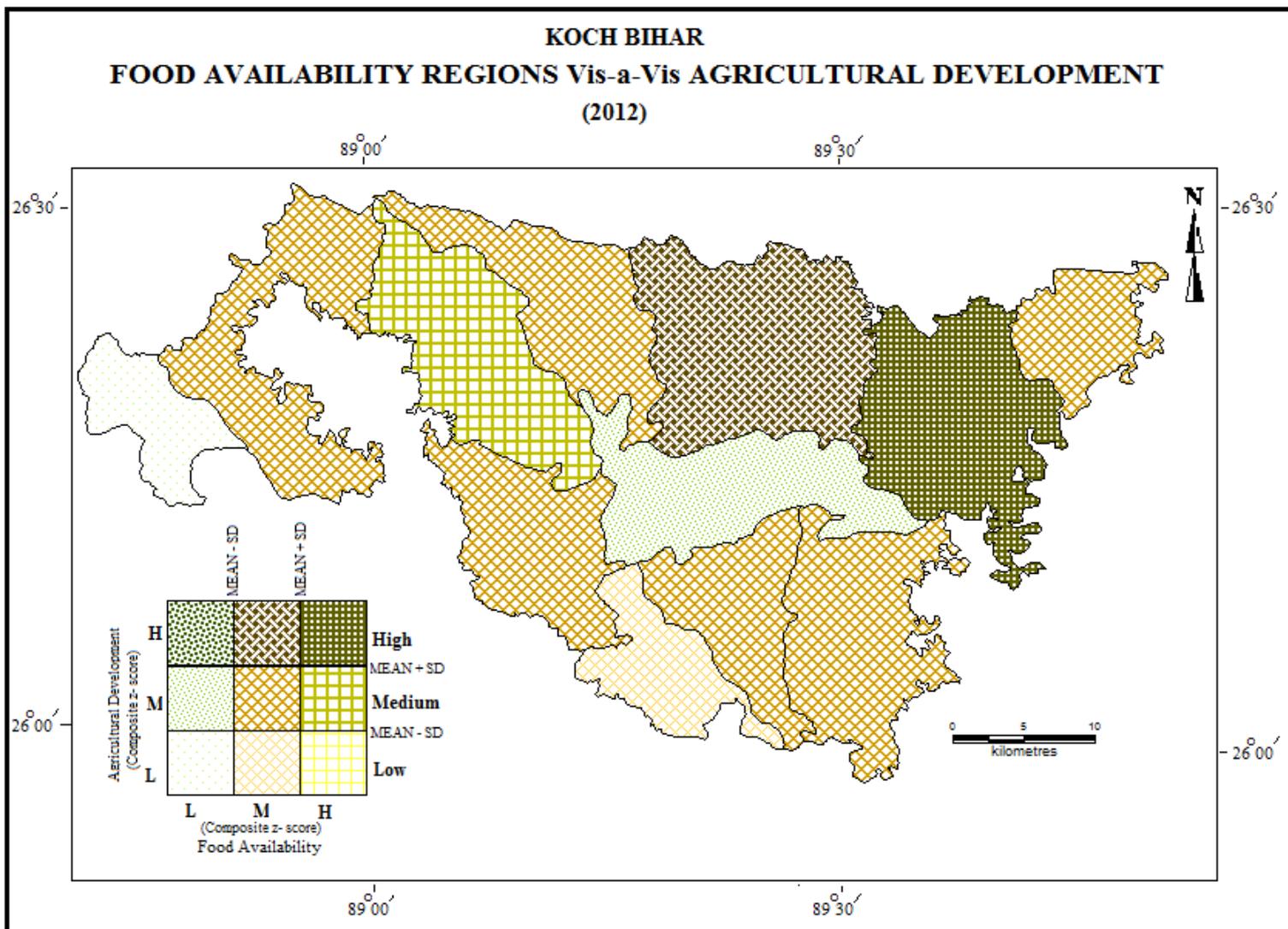
Where, t is the calculated value of 't' in the test of significance, r is the computed value of co-efficient of correlation, n is the number of observation.

Indicators: Present study is mainly based on secondary sources; to fulfilment of the objectives select some indicators for agricultural development and food security. To know the status of the agricultural development selected some indicators, these are gross cropped area, net sown area (area in ha), cropping intensity (%), cropping yield (kg. / Hectares), total irrigated area in hectors, population served per bank office (commercial & gramin, 000), number of agricultural labour in per thousand area of net sown, number of fertilizers depots etc. On the other hand to find out the status of food security selected four indicators these are i) Food Availability ii) Food Accessibility iii) Food Utilization iv) Food Stability.

Relationship between Food Availability and Agricultural Development

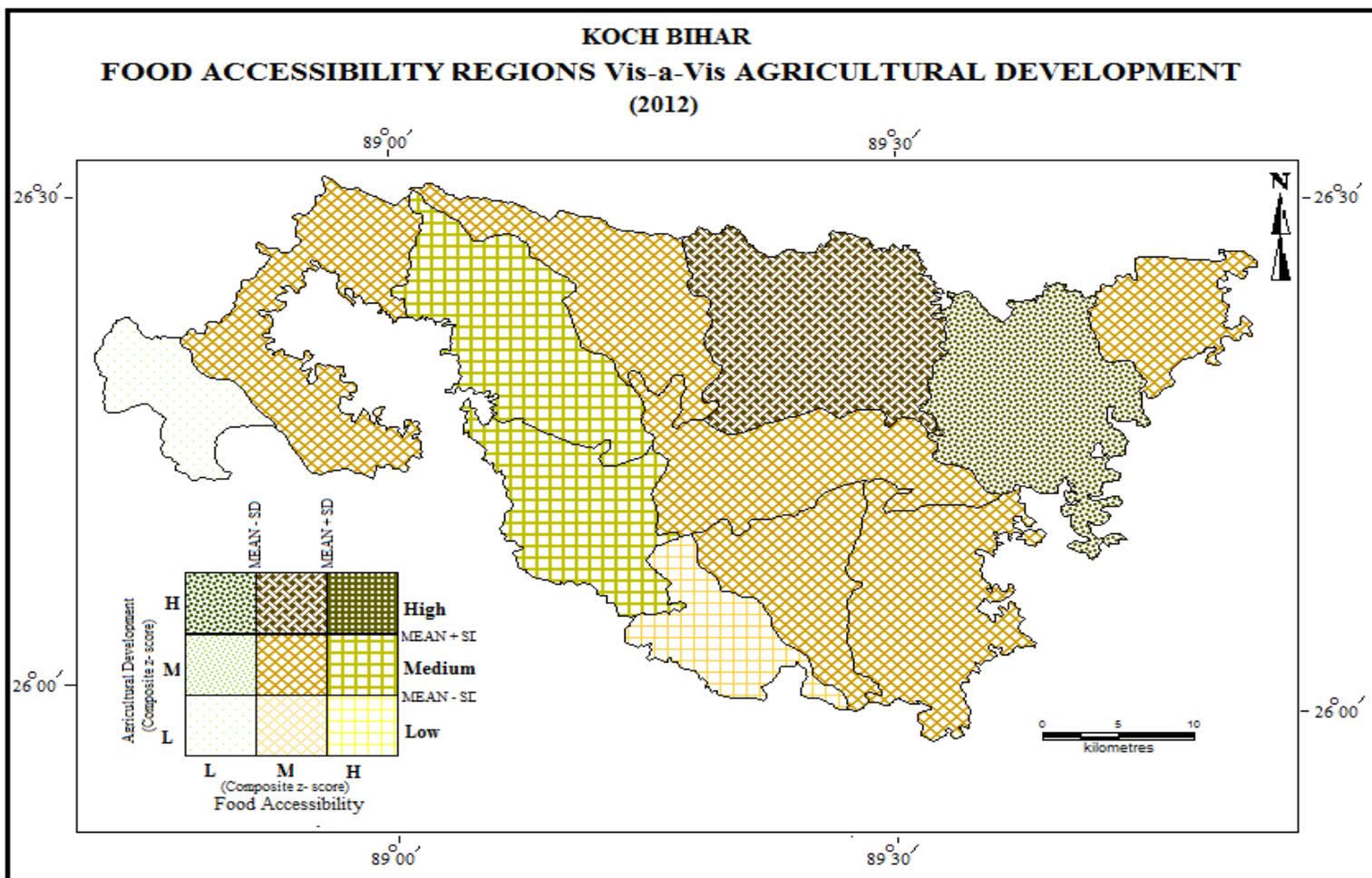
Agricultural development leads to the achievement of food security. The association between food availability and agricultural development has been traced from figure 1, which shows the Tufanganj- I block comes under the highest category of food

availability and agricultural development while on the other hand Haldibari falls under the low category of food availability and also low agricultural development. Food grains cultivation, low population concentration, gross cropped area, net sown area, high cropping intensity, high productivity are the major causes for high food availability and agricultural development in Tufanganj-I block. The blocks Mathabhanga- I and Cooch Behar- I both conform medium agricultural development. But Mathabhanga- I is -high in food availability and on the contrary Cooch Behar- I is low in food availability. The block like Cooch Behar –II fall in the category of high agricultural development but in food availability this block goes under the category of medium food available region on the other hand Mathabhanga- I fall in high food availability and medium in agricultural development. The remaining six blocks namely Mekhliganj, Mathabhanga-II, Sitalkuchi, Tufanganj-II, Dinhata-I and Dinhata-II get together in medium category in both variables. Some of the blocks are fall in the category of high and medium agricultural development especially Cooch Behar-I and Cooch Behar-II but food availability is low because of high population pressure and market oriented crop cultivation.



Relationship between Food Accessibility and Agricultural Development

Accessibility enhances the purchasing power which is necessary for agricultural development to use high prices of technology in agricultural practice. Figure 2 depicts the relationship between food accessibility and agricultural development, where Mathabhanga- I, Sitai and Sitalkuchi coincide in high food accessibility but in agricultural development they fall in medium category. In the same way Haldibari belongs to low category in both food accessibility and agricultural development. Due to low literacy rate, minimum percentage of worker population, lack of market and communication facility, low cropping intensity, low productivity, lack of gross cropped and net sown area the Haldibari block fall in low food accessibility agricultural development region in the Koch Bihar district. In food accessibility Tufanganj- I is low but high in agricultural development because of poor accessibility like high dependency ratio, lack of market facility, low literacy rate. The rest six blocks are in the medium category in both food accessibility and agricultural development.

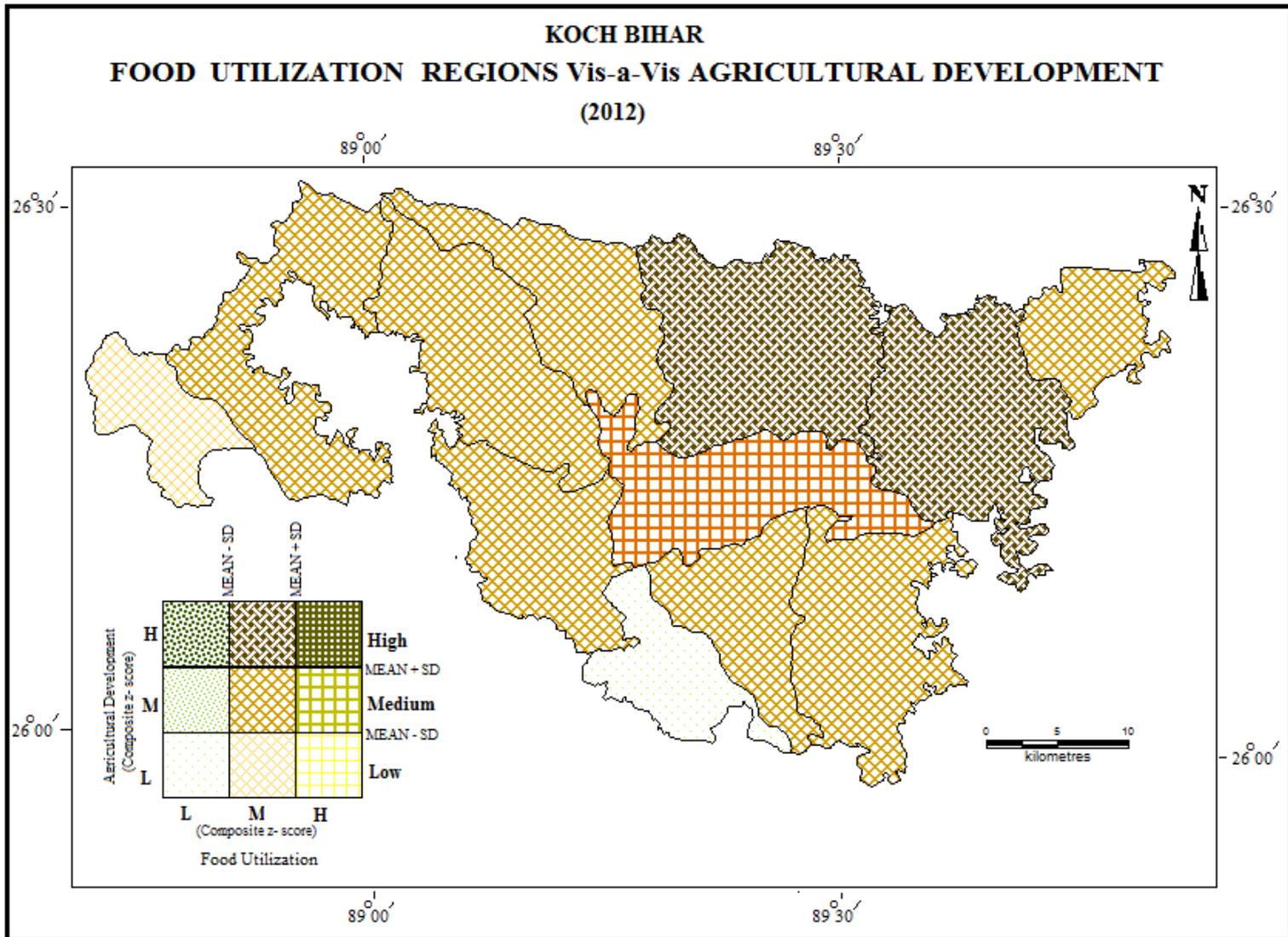


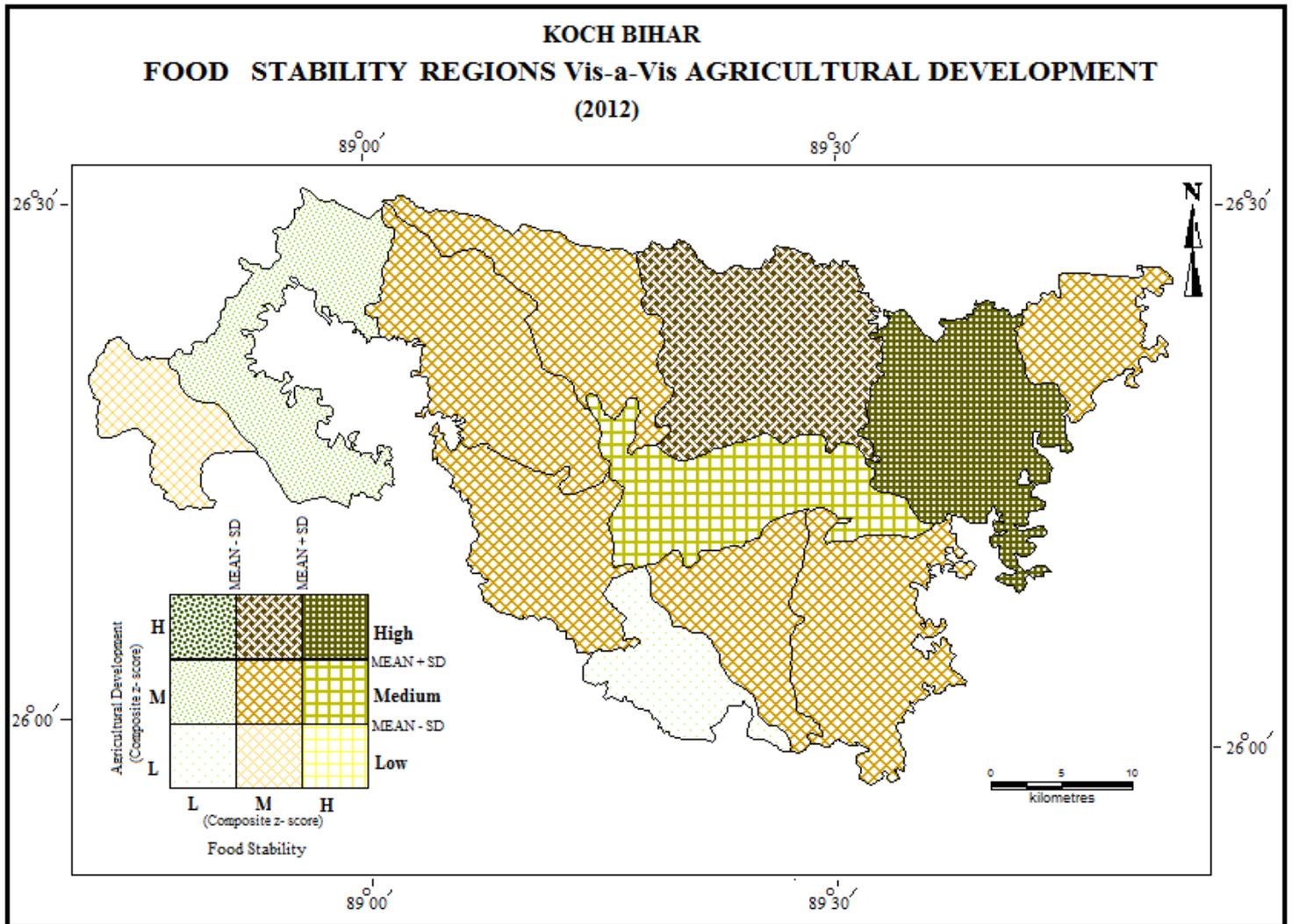
Relationship between Food Utilization and Agricultural Development

Food utilization, behavior of the people's about the food which emphasis not only to food security, but also agricultural development. Figure 3 shows the relationship between food utilization and agricultural development where Cooch Behar- I falls in high food utilization region in the study area but in agricultural development this block fall in medium category This block is located in the middle of Koch Bihar district and all kind of medical, health center, water facility, proper sanitation is available here for that this block has been fall in the category of high in food utilization region. A different situation has been found in Sitai block, where this block fall in both low food utilization and low agricultural development because of lack of medical facility, health center facility, water facility, proper sanitation, poor cropping intensity, lack of irrigation facility and fertilizers depots. On the other hand Haldibari block fall in low agricultural development and medium in food utilization. The remaining blocks belongs to the medium category in both variables. i.e. food utilization and agricultural development.

Relationship between Food Stability and Agricultural Development

Food stability is the main factor to augment the agricultural development which leads to increase food security. Figure 4 shows the relationship between food stability and agricultural development in the study area. Tufanganj- I block comes in the category of high in both indicators (food stability and agricultural development). In agricultural development Cooch Behar- I fall in the medium category but high in food stability. There are two blocksi. e. Haldibari and Sitai which are low agricultural development but only Haldibari block fall in medium category of food stability region and low in Sitai. On the other hand Mekhliganj block ranks in low category in food stability but medium in agricultural development. The rest six blocks namely Mathabhanga-I, Mathabhanga-II, Sitalkuchi, Tufanganj-II, Dinhata-I and Dinhata-II possess the medium category in the both variables. Sitai block fall in low category in both food stability and agricultural development because of minimum number of cooperative society, minimum percentage of electrified villages, low crop productivity.



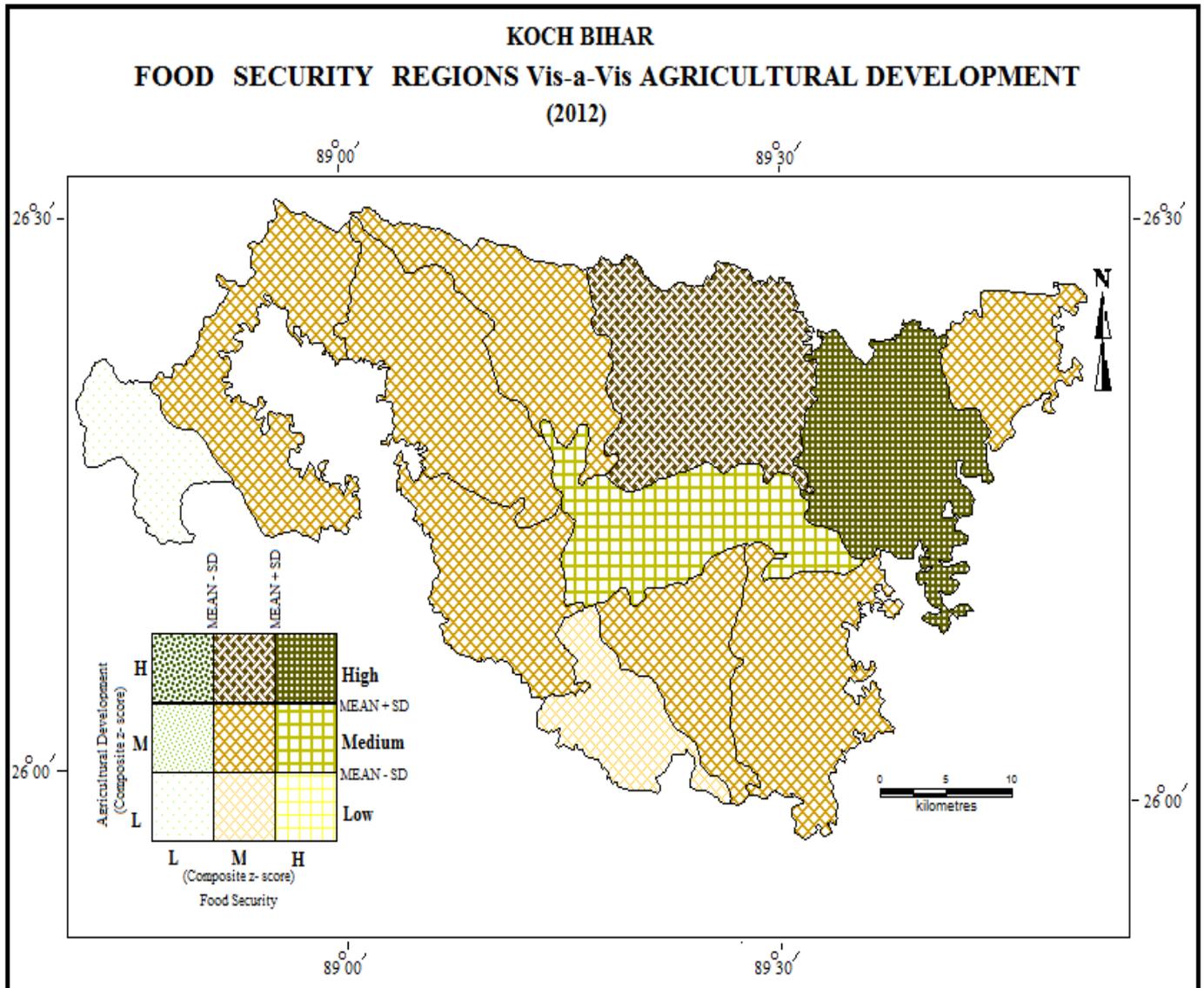


Relationship between Food Security and Agricultural Development

Overall food security is strongly correlated with agricultural development. The figure 5 demonstrated the association between food security and agricultural development in the study area, where the Tufanganj- I block comes under the highest category of food security and agricultural development while on the other hand Haldibari falls under the low category of food security and also low agricultural development. The only block (Cooch Behar- I) which fall in high food security but medium in agricultural development and on the other hand Cooch Behar-II block is high in agricultural development and low in food security because this block face lack of food availability, food accessibility, food utilization and food stability. Sitai block fall in medium category of food security but low in agricultural development. The other blocks gain the position as medium in both food security and agricultural development in the Koch Bihar district.

In fine it can be said that the every indicators of food security namely food availability, food accessibility, food utilization and food stability are positively interlinked with agricultural development in the study area. The high food security depend on the agricultural development for example Tufanganj- I comes in the

category of high agricultural development which leads the block to high food security. In food security all the indicators are equally important.



Correlation and levels of significance between food security and Agricultural Development

Correlation matrix has been drawn up with variables of food security (ten indicators of Food Availability, six indicators of Food Accessibility, three indicators of Food Utilization and seven indicators of Food Stability) and agricultural development and Karl Pearson's Correlation Coefficient technique has been used to find out the above relationship among variables of food security and agricultural development and the level of significance has been tested by using students- *t* test technique at the significance level of 1 and 5 percent (Table 1).

Table 1: Matrix correlation between Food Security and Agricultural Development variables in Koch Bihar (2012)

	Food Security	Food Availability	Food Accessibility	Food Utilization	Food Stability	Agricultural Development
Food Security	1					
Food Availability	0.40	1				
Food Accessibility	0.03	0.34	1			
Food Utilization	0.84*	0.01	-0.24	1		
Food Stability	0.89*	0.16	-0.25	0.73*	1	
Agricultural Development	0.72*	0.64**	0.04	0.55	0.53	1

* Correlation is significant at the 1 percent

** Correlation is significant at the 5 percent

Table 1 shows that food security is significantly positively co-related with food utilization ($r=0.84$), food stability ($r=0.89$) and agricultural development ($r=0.72$) at 1 per cent level of significant on the other hand agricultural development is significantly positively co-related with food availability ($r=0.64$) at 5 per cent level of significant and also food utilization is significantly positively co-related with food stability ($r=0.73$) at 1 per cent level of significant. Food accessibility is negatively co related with the food utilization ($r= -0.24$) and food stability ($r= -0.25$) in the study area. The agricultural development is positively related with the food security ($r=0.72$) and its variables (Food Availability, Food Accessibility, Food Utilization and Food Stability).

Conclusion: It may be conclude from the above analysis that agricultural developments have positive impact on food security in the study area. Agricultural developments have increased our production of crops which help to reduce our food deficiency means increase per capital availability of food crops. Implication of modern technology like tractor, fertilizers, insecticides, pesticides, high yielding variety of seeds, irrigation facility the total production and yield became double in the study area. Due to the agricultural development in some region of the study area famers give their attention on the cash crops cultivation for earn huge amount of money, income is positively related with the food accessibility or purchasing power of the people but negatively related with the food availability for that some blocks are fall in the category of medium food security and high in agricultural development such as Cooch Behar-II. Koch Bihar one of the districts of West Bengal is an agriculturally dependent district, which is located mainly in the northern corner of the West Bengal state. The above discussion clearly indicates that cultivable area of the district gradually declining mainly food grains area due to impact of modernization in agricultural activity. Food grains

production is positively related with the food grains availability and negatively related with population growth. To achieve the desired levels of productivity, immediate steps should be taken to improve infrastructure – such as power, rural roads and marketing in particular and, arrange for the supply of quality seeds, balanced use of fertilizers, adequate machinery, required changes in land policy, a farmer friendly extension service and an effective credit delivery system in keeping with adequate credit absorptive capacity of the farmers in the study area. Agriculture should be further developed which not only increases food availability in the study area but also enhance Purchasing Power of people by providing them employment and money. Lastly, government should create a system which is authentic, creative, eco-friendly, active in feedback, and heavily responsive for the welfare of human beings.

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