IOSR Journal of Economics and Finance (IOSR-JEF)
e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 7, Issue 1. Ver. II (Jan. - Feb. 2016), PP 43-50
www.iosrjournals.org

Regional Disparity In The Perspective Of Agricultural Development – A Spatio-Temporal Analysis, Ajay-Mayurakshi Interfluve, Birbhum District, West Bengal, India

Dr. Sandipan Chakraborty[1], Soumita Ghosh[2],
[1]*Associate Professor, P.G. Dept. Of Geography, Chandernagore College, WB*
[2]*Assistant Professor, Hooghly Women's' College, Hooghly, WB*

Abstract: *Land is the basic resource of a nation. Land utilization expressed a reciprocal relationship between the prevailing ecological condition and human society of a region. Land use is an important aspect of geographical studies and it is the process of exploring the land for a specific objectives. The increasing population pressure, low man-land ratio, increasing rate of degradation of land are responsible for the optimal utilization of land resources. The use and over utilization of land can be accessed from its detailed analysis. Agriculture is one of the most complex and dynamic expressions among all primary economic activities performed and its structural, functional and development capacities depend on the interaction of several attributes or elements of environment. Human population spread only to those areas of the world where agriculture was possible and agricultural developments has taking place. Some* ***selected and basic indicators*** *have been used as measures of agricultural development, in terms of temporal trend as well as spatial patterns, which may be the prime factors behind the Regional Imbalances among the different parts of the region.* ***The study area*** *selected for the present study is the interfluve of Ajay-Mayurakshi River, parts of Birbhum district in West Bengal. Geographically, interfluve of Ajay-Mayurakshi River is a part of ancient "Rarh Bhumi" of Bengal, having favourable agro-environmental condition. The proposed interfluve region is mainly rain fed and intensified by mono-cropped cultivation system, still suffers by inter-regional disparity in agricultural development. The* ***major objective of the present study*** *is to undertake a comprehensive study to examine the general and existing land use pattern and to measure the land use efficiency with the help of cropping intensity index and finally to devise a suitable index of agricultural development and put focus on the regional disparities as well as regional problems; as an integral part of the agricultural development planning and management. For this specific study* ***modern methodology and techniques*** *of interpretation will be taken into account for final inference of the study.*

Key Words*: Land utilization, Cropping Intensity, Agricultural Development, Productivity, Regional Disparity, Planning and Management.*

I. Introduction

Landscape is a natural arrangement of integrated tracts of land, which is very complicated and subsequently influences the degree of land use practices. Land use is thus, the result of interaction among morphologic, climatic and socio-economic parameters in macro, meso and micro levels. ***Land use is the application of human controls***, systematically to the key elements of any ecosystem to derive benefit from it and man, being an essential part of the ecosystem tries to manipulate it. It is also the cumulative output of historical events, the interaction of economic forces with the natural environment, and the values of society. Despite, the significant ***influence of the natural environment on the land-cover and land use***, subsequent adjustments of land use to the cultural ecology are clearly evident. The study of land use is an urgent need for resource planning, cultural advancement as well as overall economic development of any area and the potentiality of any geographical region mostly depends on the extensive and intensive use of lands. However, economic and cultural advancement can better be carried out only through the systematic and balanced utilization of land. Thus, geographers can't think about regional and local level development without proper and optimum use of land. So, the integrated land use study is of immense value for human sustenance.

Agriculture has been the subject matter of the geographical study since past. It is not only because most of the people depend for food and several raw materials on it but also because largest fraction of land under human occupancy, is used for different agricultural purposes. It is still largely dependent on environmental conditions and presents wide spatial variation. Agriculture is main occupation of working population and major source of income in developing countries. Though significance of agriculture in terms of employment and generation of national income is gradually declining, the development of agriculture is an essential, though by no means, a sufficient condition for rural development in such countries. Nevertheless, overall development in agriculture will strengthen the rate of industrial development by increasing food production capacity, by capital

formation, by providing market for industrial output of consumer's goods, and lastly be utilizing agricultural inputs originated in industrial sector. In this perspective, Agricultural Development Planning and evaluation of agricultural development itself assume top position in overall development planning.

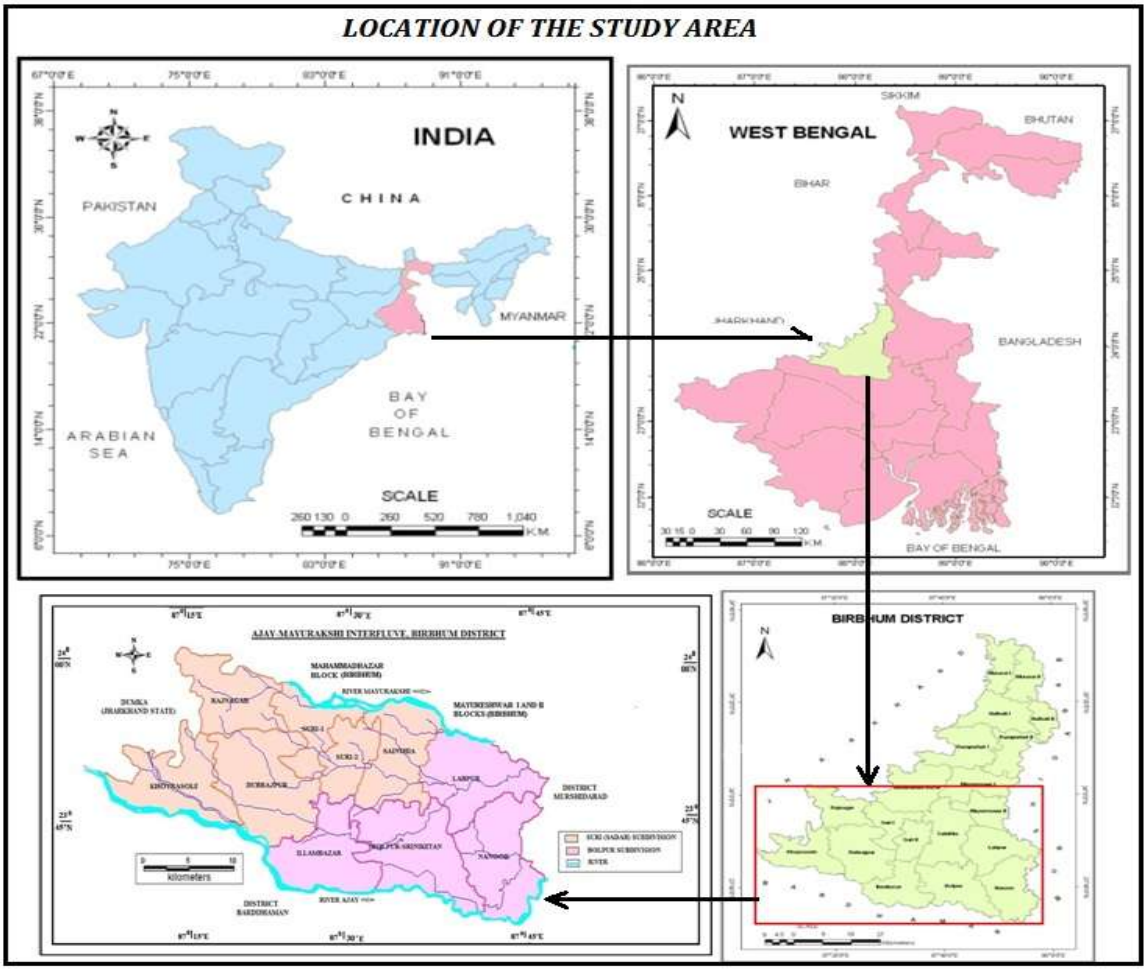
Objectives of the Present Study

The major objective of the present research is to reveal the levels of spatio-temporal development of agriculture with respect to agro-land use pattern and to ascertain the regional disparity in relation to the perspective of agricultural development. Apart from that, the study also enlighten the facts like-

(i) To undertake a detailed and intensive land use survey and to analyse and interpret the same scientifically with a view to exploring and unfurling the potential land resources of the region,
(ii) To assign the cropping intensity and to identify cropping pattern of the study area,
(iii) To analyze spatial variation in the levels of agricultural development in the context of physical and socio-economic environment and to devise a suitable index of agricultural development, to point out the regional disparities in a quantitative form.
(iv) To highlight the status of regional disparities, and relevant problems; as an integral part of the agricultural development, planning and management.

Data base A variety of sources of data have been collected for the preparation of the present paper. Major qualitative and quantitative information and data on Agricultural have been collected from the office of P.A.O., Suri, and Birbhum. The other important sources are agricultural Census (2010-11), some unpublished reports from district agricultural department and also from the Directorate of Agriculture, Birbhum, West Bengal. Statistical Abstract (2010-11, combined), Agriculture and Livestock statistics, Census publications, District Census Handbook, District Statistical Handbook (published by Bureau of Applied Economics and Statistics, Department of Statistics and Programme Implementation, Govt. of West Bengal) etc. are some of the important sources from which the data are also collected. Basic maps have been extracted from different map series of SOI, India and NATMO.

II. Methods Of Analysis



In the present study, ***the geographer's approach of 'Areal Differentiation'*** has been followed, and in this respect it differs from approaches of Economics and Agricultural science. The whole work has been conducted by intensive observation, Field work, analysis, ground truth observation and finally inferences have been taken for conclusion and suggestion. This involved collection of all available secondary data followed by primary data which would indicate development, changes and trends in the agricultural pattern of the Interfluves. **Analyses have been taken from both absolute and percentage values.** Regions have been marked on the principle of dispersion from the central value, i.e**. mean and mapping has been done with the help of modern methods on updated GIS platform**. For all those implementation, analysis, interpretation and suitable inferences have been taken into consideration based on modern analytical techniques and presentation methods.

Study Area

The selected study area is ***the Interfluve of Ajay- Mayurakshi river,(*** **23°32'N to 23°57'N** latitudes and **87°05'E to 87°52'E** longitudes, comprising an area about 2569.86 sq. km.) parts of Birbhum district, West Bengal. The study area consists of 10 Development Blocks (Khoyrasol, Rajnagar, Dubrajpur, Suri (I and II), Sainthia of Suri (Sadar) Subdivision (Approx. area of 1391.69 Sq.km) and Illambazar, Labhpur, Nanoor and Bolpur-Sriniketan blocks of Bolpur Subdivision (Approx. area of 1178.17 Sq.km). District Birbhum ***has a complex topographic expression with acute exposure of micro-landscape.*** The surface gradually rises westward expressing an undulating landscape scatteredly dotted with rocky hillocks and mounds. The western part of the interfluves, comprising Khoyrasol, Rajnagar, Dubrajpur, Suri I and II, being a part of heavily dissected plateau of Chotonagpur, is located on hard impervious **crystalline rocks** (Archaeans) while the eastern part is made up of lateritic and alluvium (Majumdar, D., 1975). ***The approximate elevation of Eastern Alluvium plain ranges*** between 20 to 60m above mean sea level whereas, it is from 60 tom 140m in the westward undulating plateau regions. The general slope is from northwest to southeast. ***The climate is sub-humid and subtropical*** type characterized by tropical monsoon with a mean annual rainfall varies from 1275 to1430mm. About 75 percent of rainfall is received from southwest monsoon during June to September. The maximum and minimum temperature ranges between 41.5^0C to 12.7^0C. ***The predominant soil types are old alluvial and red lateritic*** with low to medium in organic carbon and phosphate content and medium to high in potash. The soil is acidic in nature with pH ranges from 5.0 to 6.5. The natural vegetation is mainly dry tropical type with deciduous in nature.

III. Results And Discussion:

Extent and Spatial Pattern of Agricultural Development

Study of the spatial pattern of land utilisation is of prime significant and human activity on the land has been the major concern for classifying land utilization, which is essentially a qualitative rather than a quantitative phenomenon. The study of Land utilization is of prime concern to a geographer to know the relationship between man, natural environment and their effective co-action. Census of India, have classified land utilization in nine different categories, but, in the present study these have been grouped into five major land use categories, for the convenience of the study. These are-

Table – 1-Land Utilization Statistics Of Ajay-Mayurakshi Interfluve, Birbhum District (2010-11)

Sl. No	*Blocks*	*Forest Area*	*Land Under Non-Agricultural Use*	*Other Cultivated land excluding fallows*	*Fallows*	*Net Area Sown*
1	*Suri-I*	*8.8*	*2.69*	*5.11*	*10.91*	*72.48*
2	*Suri-II*	*1.7*	*17.84*	*4.01*	*1.05*	*75.41*
3	*Sainthia*	*0.73*	*21.81*	*1.37*	*0.13*	*75.97*
4	*Dubrajpur*	*8.68*	*6.59*	*2.93*	*5.52*	*76.28*
5	*Khoyrasol*	*3.47*	*10.36*	*3.69*	*3.18*	*79.3*
6	*Rajnagar*	*9.38*	*11.11*	*9.57*	*8.81*	*61.14*
7	*Bolpur*	*1.2*	*2.01*	*1.05*	*1.61*	*94.13*
8	*Illambazar*	*8.33*	*N*	*0.98*	*2.5*	*88.19*
9	*Labpur*	*N*	*N*	*0.68*	*2.07*	*97.25*
10	*Nanoor*	*N*	*27.38*	*0.78*	*0.05*	*71.8*
	District	*3.08*	*9.72*	*2.6*	*3.74*	*80.87*

Source: District Statistical Hand Book, (2010-11), Birbhum District, West Bengal, CDAP, Birbhum, 2010.

The area covered by the forest is a major land cover on the earth's surface and a major element for maintaining man-nature relationship. This category includes all areas actually forests and scrubland whether reserved, unreserved or protected or administered as a forest under legal enactment. Forest area of the Ajay-Mayurakshi interfluves occupies 9091.94 hectares of land, in which Dubrajpur and Rajnagar blocks covered 4529.2 hectares (50.26% of the total interfluves) of land. The forest land has been transferred to the land of agricultural and

other uses which has been, finally, forced to decrease the forest land. ***Land not available for cultivation*** is actually including all the categories which are not practically useful for agricultural purpose. This has been further subdivided into - Barren and Uncultivable Wasteland and Land put to non-agricultural use, such as, area occupied by settlements, roads, railways and area submerged under water. This category covers almost 9.84% of the total geographical area of the study area (2010-11). ***Other Cultivated land Excluding Fallows*** consists of– Permanent pastures and Grasslands, Miscellaneous trees and groves, Cultivable Wasteland. Actually economic boosting is partially possible if renovation and rectification of this category is done. In the studied area permanent pasture covers 1920.75 hectares (0.74%), Land under miscellaneous trees and groves covers 1104.34 hectares (0.42%) and Cultivable Wasteland covers 3389.33 hectares (1.30%) of the total geographical area of the district (2010-11). In the studied area ***fallow land*** covers a considerable percentage and consists of two sub-categories, such as, Fallow land other than current fallow and current fallow land. Fallow land other than current fallow covers almost 3370.27 hectares (1.29%) and Current Fallow land covers 3978.53 hectares (1.52%) of the total geographical area. It is possible to transform a certain percentage of current fallows to agricultural land, if environmental favourability allows the same. **Net Sown Area is a distinct indicatrix of the agro-economic base of any region**. The studied region is basically a mono-cropped area, though agriculture is the backbone of this region. Actually, it shows the extent of cultivated area in any region during a year. During the year 2010-11, the Net Sown Area accounted for 183323.06 hectares, which is 70.25 percent of the total reporting area of the whole district.

Cropping Intensity – A Qualitative and Quantitative Review

The cropping intensity implies a farming region, where more than one crops are raised in a single year (Singh, 1979). It may also reveal qualitative as well as the quantitative aspects of the agricultural land use. The rapid growth of population has been creating an immense pressure on land resources and it has becoming a tendency to put an area under multiple cropping lands. Land is becoming inextensible; therefore, intensification of cultivated area is the only alternative measure for increasing agricultural production. Cropping pattern mainly depends on physical, technological and institutional factors, such as, favourable climate, irrigation facilities, agricultural mechanization, use of chemical fertilizers, pesticides, insecticides, use of HYV seeds etc. Impact of these factors helps to transform land use efficiency, which means the degree of extent to which the Net cultivated area to the net sown area, gives a measure of land use efficiency, in other words, may be termed as cropping Intensity. This index provides a measure of land use efficiency, which may define the extent to which the net sown area is cropped or double cropped. Therefore, higher the index of cropping intensity, higher the land use efficiency and lower the index, lower is the land use efficiency and less utilised or underutilized the net sown area. ***Index of cropping intensity (C_I) has been calculated on the basis of following principle-***

$$C_I = GCA/NCA * 100$$

Where, GCA stands for Gross cropped area and NCA for the Net area sown.

The district as a whole has Cropping Intensity of 163.1 in the year 2010-11. ***Table 2 indicates*** the cropping intensity of ten C.D. blocks of Ajay-Mayurakshi Interfluve, for the year 2010-11. On the basis of the indices of Cropping Intensity blocks have been grouped into High, Medium and Low category

Development of Agriculture in the Studied Region

Agricultural Development is a multi-dimensional concept and it encompasses the meaning of both 'Agriculture' and 'Development'. It may be envisaged as the agricultural performance of an area in terms of economic gains in Yields, social justice it delivers and ecological balance it maintains. Agricultural Development is a necessary condition for overall economic growth and it implies a **maximum economic utilization of land.**

Table 3: District Profile At A Glance On Agricultural Point Of View

Particulars	Area in '000 hectares(approx)
Reporting area	451.12
Cultivable area	333.28
Area under non-agricultural use	96.82
Barren and uncultivable land	0.28
Permanent pasture and other grazing land	0.18
Cultivable waste land	3.88
Fallow other than current fallow	2.37
Current fallow	12.34
Forest area	15.85
Land under misc. tree groves not included in NSA	0.86
Net Cropped Area	318.5

Gross Cropped Area	**560.8**
Area sown more than once	**242.3**
Cropping Intensity	**176**
Net Irrigated Area	**315.93**
Gross Irrigated Area	**539.6**
Rainfed Area	**21.04**

Source: District Statistical Hand Book, (2010-11), Birbhum, CDAP, Birbhum, 2010.

As per **2011 census**, the rural population of Birbhum district is **91.43%**. Agriculture is the primary occupation of rural Birbhum. More **than 60% of the** total population of the district is dependent on farming. **Agricultural development** has been expressed differently by distinguished geographers. Based on the availability of data and case of computation the following parametric factors have been considered for the computation of a combined Rank Score of Agricultural Development. Those are - *Irrigated Area, Cropping Intensity, Net Sown Area, Productivity, Degree of Commercialization, No. of Fertilizer depots, Fertilizer Consumption, Supply of Bio pesticides, Cattle Density.All those parameters are measured and expressed in the following steps-*

Irrigated Area is expressed as percentage of the net sown area; ***Cropping Intensity*** is calculated by the factors of- ***(Double cropped area/ Net sown area × 100)***; ***Net sown area*** is expressed as % to total area. In present study the ***productivity*** is expressed by the principle used by ***Shafi, M. (1972) which is a modification over the formula devised by Enyedi, G.Y. (1964). The productivity for various blocks has thus, been calculated***

Degree of Commercialization *is* ***expressed*** as percentage of commercial crop area to total cropped area; ***Number of fertilizer depots*** Absolute values for each block; ***Fertilizer consumption (kg/ha.)****is expressed as an* absolute value for each block.

1. ***Irrigated Area -*** is expressed as percentage of the net sown area.
2. ***Cropping Intensity*** - calculated as per rule
3. ***Net sown area -*** is expressed as percentage to total area.
4. **Agricultural *Productivity - In*** present study the productivity is calculated by the formula used by Dr. Shafi, M. (1972) which is a modification over the formula devised by Enyedi, G.Y. (1964).
5. ***Degree of Commercialization -*** expressed as percentage of commercial crop area to total cropped area.
6. ***Number of fertilizer depots -*** expressed as total no. of fertilizer depots for each block.
7. ***Fertilizer consumption -*** Chemical Fertilizer consumption (NPK) in Kg/Hectares.
8. ***Supply of Bio-pesticides -*** absolute values for each block.
9. ***Cattle Density -*** Total number of cattle of each block is divided by the total area.

Calculation of combined Rank-Score of Development

Firstly, values for the selected 9 factors for al 10 blocks were calculated. The values for each factor were arranged in descending order and were ranked from 1 to 10. For the calculation of combined score, Kendall's (1939) *'Ranking Co-efficient Method'* was used. In the first step, for each block, its respective rank order score for nine selected factors was posted and was added to give a total rank score. This score was considered as an Index of agricultural development and it is *inversely related to the total rank score* i.e., *Higher the score, lower is the block on the development scale.*

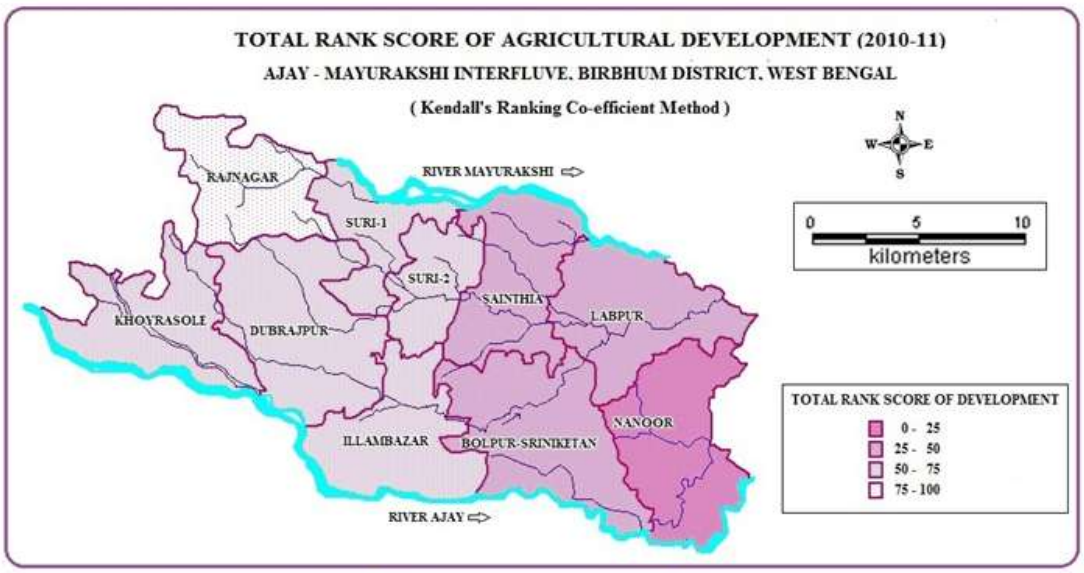
TABLE - 4a: Composite Rank Score Of Selected Factors Of Development

Source: calculated and compiled by the author, 2011

Sl No	01	02	03	04	05	06	07	08	09	10	Composite Rank
1	***Suri - I***	*6*	*4*	*10*	*8*	*5*	*5*	*3*	*4*	*10*	*55*
2	***Suri – II***	*3*	*7*	*3*	*5*	*7*	*9*	*7*	*6*	*6*	*53*
3	***Sainthia***	*2*	*2*	*5*	*3*	*2*	*6*	*1*	*5*	*3*	*29*
4	***Dubrajpur***	*9*	*8*	*7*	*4*	*8*	*4*	*6*	*9*	*8*	*63*
5	***Khoyrasol***	*8*	*9*	*2*	*9*	*9*	*8*	*9*	*8*	*4*	*66*
6	***Rajnagar***	*10*	*10*	*9*	*10*	*10*	*10*	*8*	*10*	*7*	*84*
7	***Bolpur***	*4*	*3*	*8*	*7*	*1*	*1*	*5*	*3*	*9*	*41*
8	***Illambazar***	*7*	*6*	*6*	*6*	*4*	*7*	*10*	*7*	*5*	*58*
9	***Labpur***	*5*	*5*	*1*	*2*	*6*	*3*	*4*	*2*	*2*	*30*
10	***Nanoor***	*1*	*1*	*4*	*1*	*3*	*2*	*2*	*1*	*1*	*16*

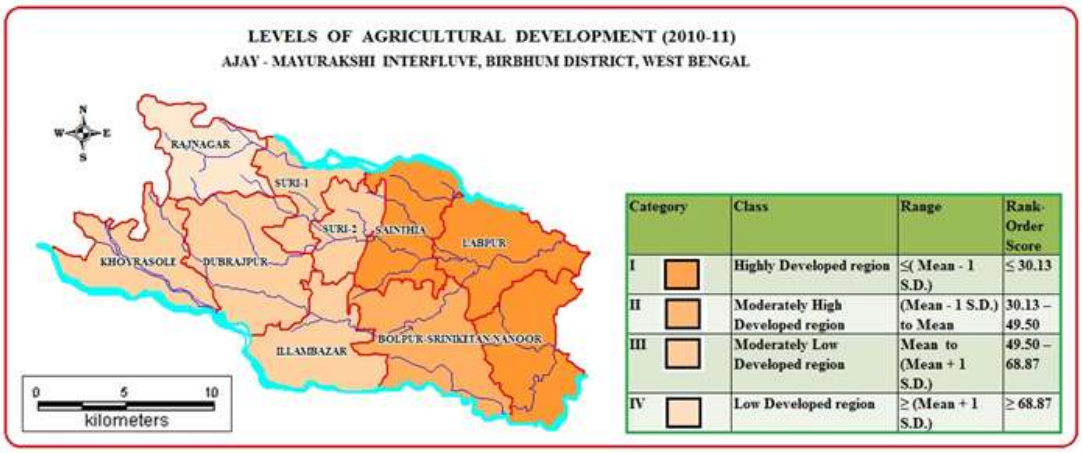
01- Blocks, 02- Irrigated Area, 03- Cropping Intensity, 04- Net Sown Area, 05- Number of Fertilizer Depot, 06- Fertilizer Consumption, 07- Supply of Bio-Pesticide, 08- Degree of Commercialization, 09- Productivity, 10- Cattle Density,

Fig. 2: Map COMPOSITE SCORE HIRARCHY OF THE STUDIED BLOCKS



Source: Calculated and Compiled by the Authors, 2015.

Fig. 3: CLASSIFICATION OF THE BLOCKS, ACCORDING TO THE LEVELS OF DEVELOPMENT,



Source: Calculated and Compiled by the Authors, 2015.

Table 4b: Total Rank- Order Score Of Different Blocks

Composite Rank	*No. of Blocks*	*Name of the Blocks*
0 - 25	01	Nanoor
25 - 50	03	Sainthia, Bolpur-Sriniketan, Labpur
50 - 75	05	Suri – I and II, Dubrajpur, Khoyrasol, Illambazar
75 - 100	01	Rajnagar
	N = 10	

Source: Calculated and compiled by Author, 2011

Calculated value of Mean and Standard Deviation are 49.5 and 19.37 respectively
On the basis of the mean and standard deviation, blocks were divided into four categories as follows –

Table 5: Classification Of The Blocks Of Birbhum District, According To The LEVEL OF DEVELOPMENT

Category	Class	Range	Rank-Order Score	No. of Blocks	Name of Blocks
I	Highly Developed region	≤ (Mean - 1 S.D.)	≤ 30.13	03	Labpur, Nanoor, Sainthia
II	Moderately High Developed region	(Mean - 1 S.D.) to Mean	30.13 – 49.50	01	Bolpur-Sriniketan
III	Moderately Low Developed region	Mean to (Mean + 1 S.D.)	49.50 – 68.87	05	Suri – I and II, Dubrajpur, Khoyrasol, Illambazar
IV	Low Developed region	≥ (Mean + 1 S.D.)	≥ 68.87	01 N=10	Rajnagar

Source: Calculated by Authors

Regions of Agricultural Development

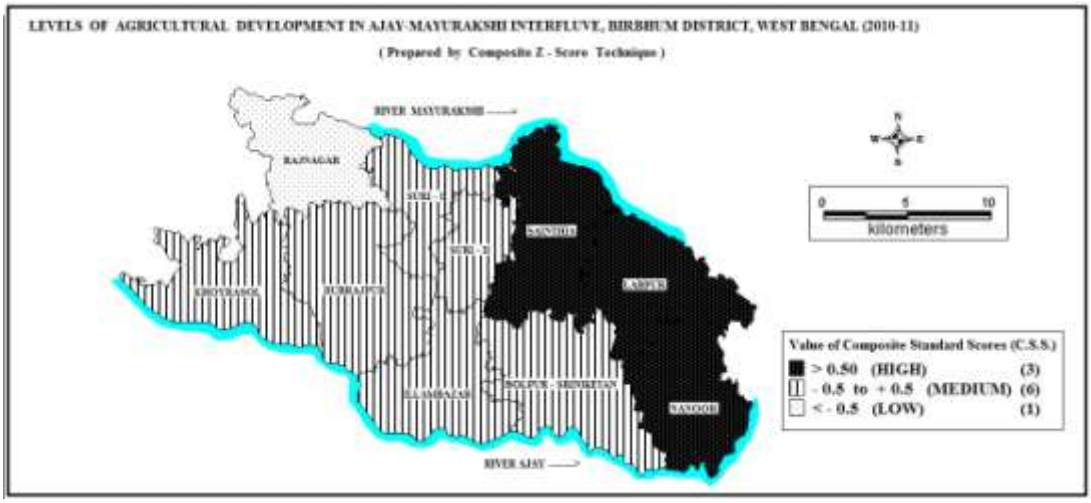
1. **Highly developed region –**

   Higher level development is mainly due to the availability of Irrigation facilities. Irrigated area in these blocks is from 65 to 70 percent of the net sown area as compared to the district average of 45 percent. This region mainly situated in the gently sloping lower undulating alluvial plains of floodplains with imperfectly drained with slow permeability.

   Light Brownish gray silty, clay, massive, firm sticky and plastic. Neutral pH (6.8), heavy textured varies from silty clay (Ental) to clay, highly suitable for paddy cultivation. Improvement of drainage is necessary to grow other crops like wheat, gram, mustard etc. in Rabi season.

2. **Moderately high developed region**

   Situated in gently sloping upper undulating alluvial plain, within sub tropical sub humid climate, moderately well drained with moderate to very slow permeability, pH (7.4), soils are very deep, medium textured with high available water capacity, suitable for Rice in kharif season and wheat, pulses and oilseeds can be grown in rabi season.



Moderately low developed region

Due to lack of Irrigation facility, agricultural productivity is low in this region, only 20 – 30 percent land are irrigated only in the kharif season. Gently sloping Undulating plateau surface with weathered granitic surface and well drained with moderately rapid permeability with Granite and Gneiss, as soil parent materials. Under forests and partly cultivated to paddy, pulses and vegetables. The soils are susceptible to erosion in deforested areas. The Cultivation in kharif can be done with proper soil conservation measures.

Less developed region

Only one block with the lowest agricultural development is distributed in scattered pattern; with minor exception of highly undulating plateau terrain, poor soils, lack of irrigation facilities, inadequate soil drainage. Iron-manganese concretions and strong brown to dark brown mottles are present in the subsoil, makes it in fertile. Soil is strongly acidic in nature and light too medium in texture. These areas were under degraded sal forests.

IV. Conclusion And Suggestions

From different indices, analysis and interpretation regarding the nature of agricultural development in terms of qualitative and quantitative principles, it appears that the interfluve commands a high status regarding agricultural activities and development due to favourable agro-environmental condition in the respective regions, though there are varied anomalies in relation to the elements of physio-agricultural environment . Rice is the staple as well as distinctive crop in the region and less diverse combination is found within the study area.
Use of quantitative index of the development of the agricultural development brings out clearly the fact that, there exists a wide disparity in the levels of agricultural development in the study area. One single factor which has influenced the development to the higher degree is the availability of irrigation facility.
From the planning point of view, the region of low development is of great importance because without a proper planning of these low developed region, an all-round development of the total geographical region are not possible. An ideal land use survey and associated land use planning and development played a decisive role for land management practices and only then it will accelerated the growth of agricultural development in future.

References

[1]. Ahmed, E. (1992), "Geomorphology and Agriculture", the Ecology of Agricultural System, Noor Mohammad (ed.), Concept Publishing co., New Delhi.
[2]. Bagchi, K. and Mukherjee K.N. (1979), Diagnostic Survey of Rarh Bengal.
[3]. Baker, O.E. (1921), The Increasing Importance of the Physical Conditions in Determining the Utilization of Landfor Agricultural and Forest Production in the United States, : Annals of the Association of American Geographers, Vol. 11 (1921), pp. 17-46
[4]. Bamwerinde, W.,Bashaasha, B., Ssembajjwe, W., Place, F. (2006) , Determinants of Land use in the Densely populated kigezi highlands of South Western Uganda, Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18.
[5]. Burrough, Peter A. (1986), "Principles of Geographical Information Systems for Land Resources Assessment". Oxford Science Publishers, Monographs on Soil and Resources Survey No. 12, Clarendon Press, Oxford.
[6]. Chatterjee, S.P. (1952), "Land Utilization Survey of Howrah district, Geographical Review of India, Vol.-14, No.-3, pp. (34-39).
[7]. Chomitz, K.M.and Thomas, T.S. (2003), Determinants of Land Use in Amazônia: A Fine-Scale Spatial Analysis, American Journal of Agricultural Economics, Vol. 85, No. 4 (Nov., 2003), pp. 1016-1028.
[8]. Crist, R.E. and Chardon, C.E. (1941),Changing Patterns of Land Use in the Valencia Lake Basin of Venezuela, Geographical Review, Vol. 31, No. 3 (Jul., 1941), pp. 430-443.
[9]. Davidson, Donald A. (1992), "The Evaluation of Land Resources". Longman Scientific, London
[10]. Higgins, G.M. and Kassam, A.H. - "The FAO Agro-Ecological Zones Approach to Determination of Land Potential", Pedologie, XXXI, 2, 1981, pp. (147-168).
[11]. Hironi, K. (1991), Landuse Planning and Geomorphology- A Study of Sawai Madhopur,Concept Publishing Company, New Delhi.
[12]. Hunter, W.W. (2001), Statistical account of Birbhum, Department of Higher Education, Government of West Bengal, Calcutta.
[13]. Joshi, Y.G. and Dube, J. (1979), Measurement of Regional Disparity in the Level of Agricultural Development in Madhya Pradesh, The Deccan Geographer, India, Vol.-XVII (October-December), No.-3, pp. 585-593.
[14]. Majumdar, Durgadas (1975), West Bengal district gazetteers (Birbhum).
[15]. Malley, O.O. (1996), Bengal district gazetteers, Birbhum, Government of West Bengal.
[16]. Mandal, R.B. (1982,) Land utilization- Theory and practice, concept publishing company, New Delhi.
[17]. Mather, A.S. (1986), Land use, Longman group, U.K. limited.
[18]. Mohammad, N. (1978), Agricultural Land use in India, Inter-India Publication, Delhi.
[19]. Pendleton, R.L. (1943), Land Use in North-eastern Thailand, Geographical Review, Vol. 33, No. 1 (Jan., 1943), pp. 15-41.
[20]. Roy Choudhury, S.P. (1966), Land and Soil, National Book Trust, New Delhi.
[21]. Saha, P.K. (1974)," Research Methodology in Agricultural Land Classification", Geographical Review of India, Calcutta, Vol.-36, No.-2, pp. (115-119).
[22]. Sen, A.K. (1957), "land Utilization and Agricultural Planning in Mathpalsa Union of Birbhum, West Bengal", Geographical Review of India, Vol. - 19, No.- 4.
[23]. Sharma, S.C.(1991), Land-use Survey In Terai Tract:A Study of Eastern Uttar Pradesh, Concept Publishing Company, New Delhi.
[24]. Siddiqui, S.H., Ahmad, M. and Shafi, S.P. (2010), Changing Land use Pattern and Cropping Intensity: A Case Study of Dadri Development Block, Gautam Buddh Nagar District,U.P., India, Regional Symbiosis, Vol.-18, pp.53-66.
[25]. Singh, J. and Dillon, S.S. (1984), Agricultural Geography, Tata – Mc Grew Hill Company, New Delhi.
[26]. Stamp, L.D. (1950), The land of Britain- Its Uses and Misuses,(2nd ed.), Longmans, Green and Company limited, London.
[27]. Vink, A.P.A. (1975), Land use in Advancing Agriculture, Advance Series in Agricultural Sciences I, Springer Verlag, Berlin-Heidelberg.
[28]. White, F.; Fleming, F. 1980. An analysis of competing agricultural land uses. Southern Journal of Agricultural Economics. 12: 99-103.
[29]. Zhang, X., Mount, T.D. and Boisvert,R.N.(2000), Industrialization, Urbanization and Land use in China, EPTD discussion paper no. 58, Environment and Production Technology Division, International Food Policy Research Institute, Washington, D.C., U.S.A.