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Regional Disparities in the Levels of Agricultural Development in Aligarh District of Western Uttar Pradesh

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Abstract- Agriculture is an economic activity that manifests the complex relationship between natural and human resources. The growth of agriculture is prerequisite for overall development of Indian economy. It contributes significantly to the export earnings and affects the performance of other sectors of the economy through forward and backward linkages. The present paper analysis disparities in agricultural development in Aligarh district at block level during the period of 2011-12. The analysis of the study have been carried out by transforming and combining data related to various variable, (percentage of literate people to total population, percentage of agricultural workers to total workers, percentage of net sown area to total geographical area, fertilizers consumption in kg per hectare, percentage of net irrigated area to net sown area, percentage of canal irrigation to the net irrigated area, percentage of tube well irrigation to the net irrigated area, number of agricultural implements per thousand hectare, cropping intensity) using Z score to get composite score, development of blocks have been categorized into three categories i.e., high, medium and low. The results of the aforesaid analysis the modern technological inputs have reciprocal relationship with agricultural development in the study area.

Index Terms- disparity, levels, development, variables, technology.

I. INTRODUCTION

Agriculture is undoubtedly one of the most important economic activities of man. It provides not only the food to the teaming billions of the world but also a number of industrial raw materials. In India, the importance of this activity is all the greater as nearly 64 per cent of the total population is even now dependent upon farming. The development of change in the national output depends upon the agricultural development as it exists as a dominant sector. Agriculture is regarded as the key development in the rise of sedentary human civilization. Agriculture plays an important role in economic development, such as provision of food to the nation, enlarging exports, transfer of manpower to non-agricultural sectors, contribution to capital information, and securing markets for industrialization (Johnson and Mellor, 1961)

The term of agricultural development refers to the growth and overall changes of agriculture resulting in vertical expansion. The development of agriculture should be assessed not only by productivity levels but also with reference to inputs such as fertilizers, improved varieties of seeds and irrigation (Sharma, 1976). Agricultural development denotes the quality of agricultural system of a region; it is a multi-dimensional concept which mainly includes development in a real strength of cropped land, improvement in farm system, improved farm implements, irrigation system and irrigated area, high yielding improved varieties of seeds, chemical fertilizers, insecticides and pesticides, intensity of cropping and specialization and commercialization of agriculture (Mohammad,1980). The study of agricultural development is of immense important in agricultural planning as it helps to identify problems area which might give a clue to the planners to adopt proper remedial measures for correcting imbalances (M.G.Jadhav.1997).Swaminathan (1999) concluded that before mid-sixties, increase in food grain output in the country was attributed mostly to the growth of the cultivated area and the extension of irrigation, since, then, the new farming system symbolised by HYV of seeds, use of agro-chemical and mechanisation had the powerful impact on the food sector of the country. P. Kumar and others (2008) attempted to account agricultural growth and total factor productivity in South Asia. According to them, productivity growth in agriculture is essential for the development of the sector. Singh Richa (2004) attempted to examine equity in fertilizer subsidy distribution. She examined the issue of inter-crop, inter-regional and inter-class equity in fertilizer distribution in terms of shares of different farm classes, crops and states in total fertilizer use as well as per hectare fertilizer use across the farm. Pandey M.M. (2009) studied about the Indian agriculture to take its overall review. According to him, country has made significant progress in the adoption of modern methods of cultivation and creative infrastructure for effectively and sustainable utilizing the national resources available at its command.

Several eminent scholars have explained the need for measuring and explaining regional disparity on agricultural development and have adopted different approaches. Although considerable amount of work has been done to study the regional disparities on agricultural development both national and international levels, hardly any systematic attempt has been made in this field of district level as well as block level. In this paper an attempt is made to analyse the levels of agricultural development in the study region. The levels of agricultural development has been measured in terms of technological and economic factors, such as cropping intensity, fertilizer consumption, net sown area, agricultural implements etc.

Objectives

(i) To access the regional variation of levels of agricultural development in the study region,

(ii) To know the weaker and prosperous patches in Aligarh district,

(iii) To assess the indicators responsible for the imbalance in agricultural development in the study region.

Study Area

Aligarh district is located in the central part of the Ganga - Yamuna Doab region of western part of Uttar Pradesh. It lies between latitudes 27º34'n and 28º10'n and between 77 29' E and 78 28' E longitudes in the western part of U.P. The total population of the district accounted for 29,92,286 persons (Rural 2,456,698 persons and Urban 1,217,191 persons) and the population density in the region is 1,007 persons per km square (Census 2011). The district has been divided into five tehsils namely, Atrauli, Ghabana, Khair, Koil and Iglas. These tehsils are further subdivided into twelve blocks. They are atrauli, gangiri, Bijauli, Jawan, Chandaus, Khair, Tappal, Dhanipur, Lodha, Akrabad, Iglas and Gonda (fig.1)

Aligarh district is made-up of fertile alluvium which is remarkable for its uniformity and a levelled surface. Geologically, these deposits are older alluvium. The region enjoys a tropical monsoon climate characterized. Economically the study area is well developed because of good agricultural practices. There are five agricultural farms located in different parts of the study region where seeds of different crops prepared and supply to the farmers.

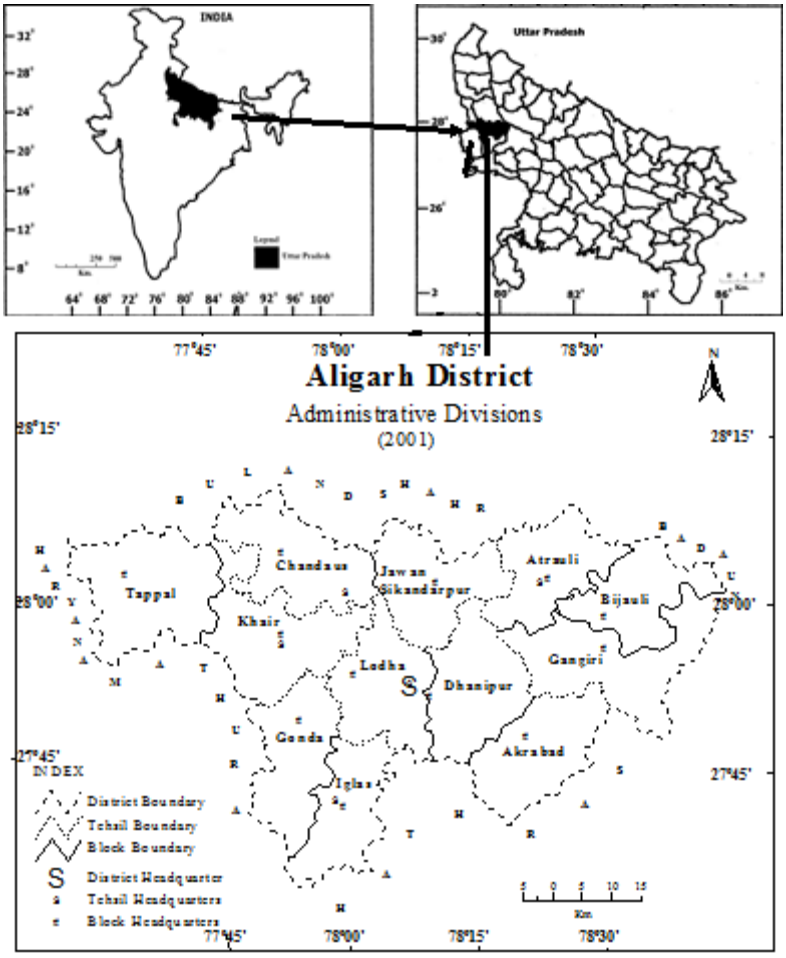

Fig.1 Study Area (Source: District Statistical Hndbook,2001)

Database and Research Methodology

The present work is based on secondary source of data. The relevant data is collected from the District Statistical Handbook. We have taken blocks as a unit at micro level under study. in order to determine levels of agricultural development following indicators are considered.

Table 1.List of selected Variables

S.No.	Variables	Definition
1	X_1	Percentage of working population to total population
2	X_2	Percentage of literate population to total population
3	X_3	Percentage of agriculture workers to total workers.
4	X_4	Percentage of net sown area to total geographical area
5	X_5	Percentage of net irrigated area to net sown area
6	X_6	Percentage of canal irrigation to net irrigated area
7	X_7	Percentage of tube well irrigation to net irrigated area
8	X_8	Number of pump sets per ten thousands of net area sown
9	X_9	Number of tractor per ten thousands of net area sown
10	X_{10}	Number of threshing machine per ten thousands of net area sown
11	X_{11}	Number of sowing instrument per ten thousands of net area sown
12	X_{12}	Number of sprays per ten thousands of net area sown
13	X_{13}	Number of harrow cultivator per ten thousands of net area sown
14	X_{14}	Number of wooden ploughs per ten thousands of net area sown
15	X_{15}	Number of iron ploughs per ten thousands of net area sown
16	X_{16}	Fertilizers consumption in kg per hectare
17	X_{17}	Cropping intensity

To determine the overall levels of agricultural development and its uneven distribution in the study area the data of the all indicators have been transformed into indices using Z-score technique. The formula is

$$Z_i = \frac{Xi - \bar{X}}{SD} \quad \ldots\ldots\ldots\ldots(1)$$

Where,
Z_i = Standard score of the ith observation,
X_i = Actual value of the ith observation,
$\bar{X}$ = Mean of the value of X variable,
SD = Standard deviation of X variable

Further, the results of the standard score obtained for different indicators, were aggregated by composite standard score (CSS) so that regional disparities in the levels of agricultural development of blocks are obtained on a mean and standard deviation scale. The composite score may be algebraically expressed as

$$CSS = \frac{\sum zij}{N} \quad \ldots\ldots\ldots\ldots(2)$$

Where,
CSS= Composite Standard Score,
Zij = Z-score of an indicator j in block i,
N = Number of indicators.

In order to classify the blocks according to their levels of agricultural development the composite Z-score have been divided into three classes that are high, medium and low.

Analysis of Variables

To determine the levels of agricultural development in Aligarh district, we have selected 17 indicators. These indicators are categorized into three categories based on z score- high, medium and low. The value of high categories ranges above +0.50. The medium group ranges from -0.50 to +0.50 and the blocks under low categories range below -0.50. These are discussed as follows-

Percentage of working population to total population (X_1)

Working population is not a highly technical term as it is used by laypersons and academicians. In simple meaning, working population refers to the number of people who are willing and eligible to work. Those who are above fifteen years of age and willing to work are considered in working population

in Indian context. The age of working population differs from one country to another country. In Aligarh district, percentage of working population to total population is relatively high in Chandaus (0.86), Gonda (0.73), Khair (0.60), Lodha (0.57) and Iglas (0.52) while it is moderate in four blocks namely Jawan (0.44), Akarabad (0.09), Dhanipur (-0.05) and Atrouli (-0.11). The remaining two blocks i.e. Bijouli and Gangiri fall under low level category. (as shown in Table 3.)

Percentage of literate population to total population (X_2)

Literacy is a necessity for all those who wish to practice the agricultural occupation on modern lines. Literacy and population growth are two factors which brings about a change in agriculture. Therefore the work of literacy has to be assessed by its effectiveness as an instrument of agricultural development on progressive lines (Jasbir Singh & Dhillon S.S., 1995). Table 3 clearly indicates that only two blocks i.e. Tappal(1.86) and Bijouli (0.86) come under high level category, whereas majority of blocks come under moderate level viz. Chandaus (0.30), Khair (0.30), Dhanipur (0.49), Iglas (0.18), Gangiri (0.12), Akrabad(-0.0), Gonda (-0.07) and Lodha (-0.45). Only two blocks namely, Jawan (-2.26) and Atrouli (-1.14) fall under low category.

Percentage of agricultural workers to total workers (X_3)

Agricultural workers maintain the quality of farms, crops and livestock by operating machinery and performing physical labor under supervision of agricultural managers. The largest number of agricultural workers has been recorded in Bijouli (1.11), Gangiri (0.93) and Akrabad (0.82) while the medium category covers seven blocks namely, Atrouli (0.44), Chandaus (0.38), Tappal (0.29), Khair (0.24), Iglas (-0.05) and Dhanipur (-0.90), remaining two blocks Lodha (-2.36) and Jawan (-1.15) fall under low category.

Percentage of net sown area to total geographical area (X_4)

This represents the total area sown with crops and orchards. Area sown more than once in the same year is counted only once. It is clear from the Table 3 that percentage of net sown area to total geographical area is occupied top position by Akrabad (1.67). After Akrabad, Atrouli(1.31), Gonda (1.01) and Iglas (0.54) blocks fall under high level category whereas it is moderate in Gangiri (0.41) and Chandaus (0.34). Remaining six out of twelve blocks fall under low category viz. Lodha (-0.66), Dhanipur (-0.73), Khair (-0.67), Jawan (-1.04), Bijouli (-1.06) and Tappal (-1.13).

Percentage of net irrigated area to net sown area (X_5)

The artificial application of water to land for growing crop is known by the term 'Irrigation' (Andrede,B., 1975). Contore L. M. (1967) defined it irrigation is artificial application of water to the soil for crop production. It has been therefore, considered as one of the important technological components of progressive agriculture – providing water under best management on scientific basis has also received importance in irrigation. Only Jawan block fall under high level category of net irrigated area whereas eight blocks namely, Tappal, (0.50), Khair (0.33), Chandaus (0.27), Atrouli (0.15), Iglas (0.09), Gonda (-0.02), Dhanipur (-0.08) and Gangiri (-0.38). It is low in three blocks i.e. Akrabad (-1.02), Lodha (-1.08) and Bijouli (-1.31). There are two methods used for irrigation canal irrigation and tube well irrigation

Percentage of canal irrigation to net irrigated area (X_6)

Canal irrigation recorded high in Dhanipur (2.05), Akrabad (1.41), Khair (0.82) and Gonda (0.58).Canal irrigation covers four blocks under moderate category namely Jawan (-0.22), Bijouli (-0.23), Iglas (0.34) and Tappal (0.41) whereas remaining four blocks fall under low category.

Percentage of tube well irrigation to net irrigated area (X_7)

Well irrigation may be said to be the indigenous form of irrigation in India. It is very well suited to the poor Indian farmer, because it is cheap to build, no elaborate machinery to work it, and does not need any specialized engineering skill to build it or to work it. It can be dug at very poor of the farmer. Therefore it is within the means of the farmers (Dubey R.N. and Negi B.S., 1968).

Tube well irrigation is high in Lodha (1.06), Chandaus (0.96), Atrouli (0.94) and Gangiri (0.71). it covers four blocks under moderate category, namely Tappal (0.42), Jawan (0.23), Iglas (0.31) and Bijouli (0.22) while it is low in Gonda (-0.57), Khair (-0.81), Akrabad (-1.41) and Dhanipur (-2.06).

Agricultural Implements

It includes the use of pumpsets, tractor, threshing machine, sowing instrument, sprays, harrow cultivators, wooden plough and iron plough. The technology diffusion in rural areas can not be regarded as independent or self explanatory, rather it has complimentarily with a number of factors (Yadav and Minocha, 1987). Agricultural implements help in increasing the production and time consuming of laborers. Variables from X_8 to X_{15} are considered in agricultural implements.

Pump sets

The largest number of pumpsets have been recorded in Gonda (1.53), Iglas (1.21), Akrabad (0.87), Bijouli (0.66) and Khair (0.62) while the medium category covers Dhanipur (-0.04), Atrouli (-0.11) and Gangiri (-0.45), remaining four blocks fall under low category.

Tractors

High number of tractors per ten thousands of net area sown is observed only in Tappal block (3.15) which is very high and only Bijouli block (-0.53) fall under low category. Remaining ten blocks out of twelve fall under medium level category. (Table 3)

Threshing machine

In the high category, there are two blocks Atrouli (2.83) and Bijouli (0.80). Fifteen percent blocks have been observed under nedium category i.e. Jawan (0.42),Gangiri (0.01), Iglas (-0.27), Lodha (-0.43), Gonda (-0.47) and Tappal (-0.49). There are four blocks namely, Khair (0.52), Akrabad (-0.62), Dhanipur (0.63) and Chandaus (-0.63).

Sowing instrument

High level of sowing instrument are found in Akrabad (1.77) , Tappal (1.44), Lodha (0.59) and Khair (0.58) whereas it is moderate in Chandaus(0.33), Iglas (0.17) and Dhanipur (-0.13).

Five blocks namely Gonda, Jawan, Bijouli, Gangiri and Akrabad fall under low level category.

Sprays

There are three blocks which fall under high level category i.e. Khair (1.72), Tappal (1.53) and Iglas (0.94). in medium level category, five blocks are considered i.e. Dhanipur (0.42), Gonda (0.16), Lodha (-0.15), Atrouli (-0.21) and Chandaus (-0.30), whereas is is low in Jawan (-0.87), Akrabad (0.87), Bijouli (-1.15) and Gangiri (-1.37).

Harrow Cultivators

High number of harrow cultivators per ten thousands of net area sown is observed in Gangiri (1.83), Tappal (1.68) and Akrabad (0.53).There are only two blocks namely Khair (0.17) and Dhanipur (-0.26) fall under medium category. Six blocks i.e. fifteen percent of area fall under low level category.

Ploughs

It is clearly shown from the table 3 that iron and wooden ploughs both have been observed in Gangiri and Bijouli. Five blocks namely Akrabad (0.17), Lodha (-0.09), Atrouli (-0.16), Dhanipur (-0.23) and Khair (-0.51) fall under medium category of wooden plough whereas in iron ploughs, seven blocks namely, Atrouli (0.15), Dhanipur (0.06), Lodha (0.04), Akrabad (-0.05), Tappal (-0.40), Chandaus (-0.40) and Khair (-0.44). Remaining blocks fall under low level category.

Fertilizers in kg per hectare (X_{16})

Fertilizers have played their crucial role for accelerating the growth of agricultural output in short period and solving the problem of low yield. The national commission on agriculture has rightly said that, "It has been the experience throughout the world that increased agricultural production is related to increased consumption of fertilizers". There are four blocks reported in the category of high level fertilizers, these are Lodha (1.56), Bijouli (1.55), Iglas (0.71) and Akrabad (0.56), whereas three blocks reported under the category of medium level fertilizers, these are Dhanipur(0.43), Jawan (0.09), and Gonda (-0.18). the remaining five blocks fall in the category of low level viz. Atrouli (-0.55), Chandaus (-0.69), Khair (-0.82), Tappal (-1.02) and Gangiri (-1.63).

Cropping Intensity (X_{17})

The cropping intensity is significant indicator of dependence on agriculture. Cropping intensity is defined as the extent to which the net sown area has been cropped. Intensity of cropping refers to the number of crops grown on the same area in a year. Therefore higher the intensity of cropping, higher is the landuse efficiency and vice versa (T.S.Chauhan, 1987). Table 3 reveals that there are three blocks, reported under high intensity of cropping i.e. Akrabad (1.99), Atrouli (1.08), Gonda (0.51). Another five blocks lie in moderate category of intensity of cropping, these are Bijouli (0.31), Iglas(0.08), Lodha (0.07), Dhanipur (-0.22) and Chandaus (-0.23) while remaining three blocks i.e. Jawan (-0.51), Khair (-1.40) and Tappal (-1.78).

II. RESULTS AND DISCUSSION

Levels of Agricultural Development

After calculating Composite Standard Score for all blocks, following results were obtained.For sake of interpretation value of index are grouped into three categories.

High Level of Agricultural Development (above + 0.09):

Fig.2 displays the spatial pattern of level of high agricultural development of the study region in 2011-12. This group of agricultural development covers 16.67 per cent area of the district. In this category, two blocks are identified namely Tappal (+0.24) and Akrabad (+0.33). Akrabad achieved high level of agricultural development due to high cropping intensity, irrigation facilities by canal irrigation, highly mechanised as supported by large number of pump sets, sowing instrument and high per hectare consumption of fertilizers. Tappal block is developed owes to more working population, highly mechanised by tractors, sowing instruments, spray machines and harrow cultivators but cropping intensity is low because of flooding in rainy season and building Yamuna Express Highways.

Moderate Level of Agricultural Development (between-0.09 and +0.09):

This category covers just half of the district total area. Six blocks have noticed in this category, namely, Khair (-0.00), Gangiri (+0.04), Bijouli (+0.05), Atrouli (+0.06), Iglas (+0.08) and Gonda (+0.09). These blocks achieved moderate agricultural development due to high working agricultural population, net sown area, tubewell irrigation.

Table 2: Levels of Agricultural Development in Aligarh District, 2011

Category	Composite Standard Score Range	No. Of District	Percentage of the Total District	Name of the Blocks
High	Above + 0.09	2	16.67	Tappal, Akrabad
Medium	Between - 0.09 and + 0.09	6	50.00	Khair, Gangiri, Bijouli, Atrouli, Iglas, Gonda
Low	Below – 0.09	4	33.33	Chandaus, Dhanipur, Lodha, Jawan

Low Levels of Agricultural Development (below - 0.09):

It comprises four blocks covering 33.33 per cent area of the district. Chandaus (-0.11), Dhanipur (-0.13), Lodha (-0.19), and Jawan (-0.37) have been reported in this category. This low development is due to low canal irrigation, net sown area, low

mechanisation, fertilizers consumption and also low cropping intensity.

Table 3: Composite Standard Score of the variables for the agricultural development in Aligarh District

BLOCKS	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	CSS
Tapapl	0.44	1.86	0.29	-1.13	0.50	-0.41	0.42	-1.51	3.15	-0.49	1.44	1.53	1.68	-0.51	-0.40	-1.02	-1.78	**0.239**
Chandaus	0.86	0.30	0.38	0.34	0.27	-0.95	0.96	-0.64	-0.19	-0.63	0.33	-0.30	-0.91	-0.38	-0.40	-0.69	-0.23	**-0.110**
Khair	0.60	0.30	0.24	-0.67	0.33	0.82	-0.81	0.62	-0.27	-0.52	0.58	1.72	0.17	-0.51	-0.44	-0.82	-1.40	**-0.004**
Jawan	0.44	-2.26	-1.15	-1.04	2.55	-0.22	0.23	-1.02	-0.26	0.42	-0.76	-0.72	-0.59	-0.75	-0.75	0.09	-0.51	**-0.370**
Lodha	0.57	-0.45	-2.36	-0.66	-1.08	-1.05	1.06	-1.34	-0.14	-0.43	0.59	-0.15	0.79	-0.09	-0.04	1.56	0.07	**-0.185**
Dhanipur	-0.05	0.49	-0.90	-0.73	-0.08	2.05	-2.06	-0.04	-0.27	-0.63	-0.13	0.42	-0.26	-0.23	0.06	0.43	-0.22	**-0.127**
Gonda	0.73	-0.07	0.25	1.01	-0.02	0.58	-0.57	1.53	-0.20	-0.47	-0.51	0.16	-0.76	-0.73	-1.12	-0.18	0.51	**0.009**
Iglas	0.52	0.18	-0.05	0.54	0.09	-0.34	0.31	1.21	-0.09	-0.27	0.17	0.94	-0.86	-0.82	-0.94	0.71	0.08	**0.081**
Atrouli	-0.11	-1.14	0.44	1.31	0.15	-0.95	0.94	-0.11	-0.42	2.83	-1.32	-0.21	-0.96	-0.16	0.15	-0.55	1.08	**0.058**
Bijouli	-2.05	0.68	1.11	-1.06	-1.31	-0.23	0.22	0.66	-0.53	0.80	-0.94	-1.15	-0.65	1.52	1.84	1.55	0.31	**0.045**
Gangiri	-2.05	0.12	0.93	0.41	-0.38	-0.70	0.71	-0.25	-0.45	0.01	-1.23	-1.37	1.83	2.48	2.09	-1.63	0.10	**0.036**
Akrabad	0.09	-0.01	0.82	1.67	-1.02	1.41	-1.41	0.87	-0.33	-0.62	1.77	-0.87	0.53	0.17	-0.05	0.56	1.99	**0.328**

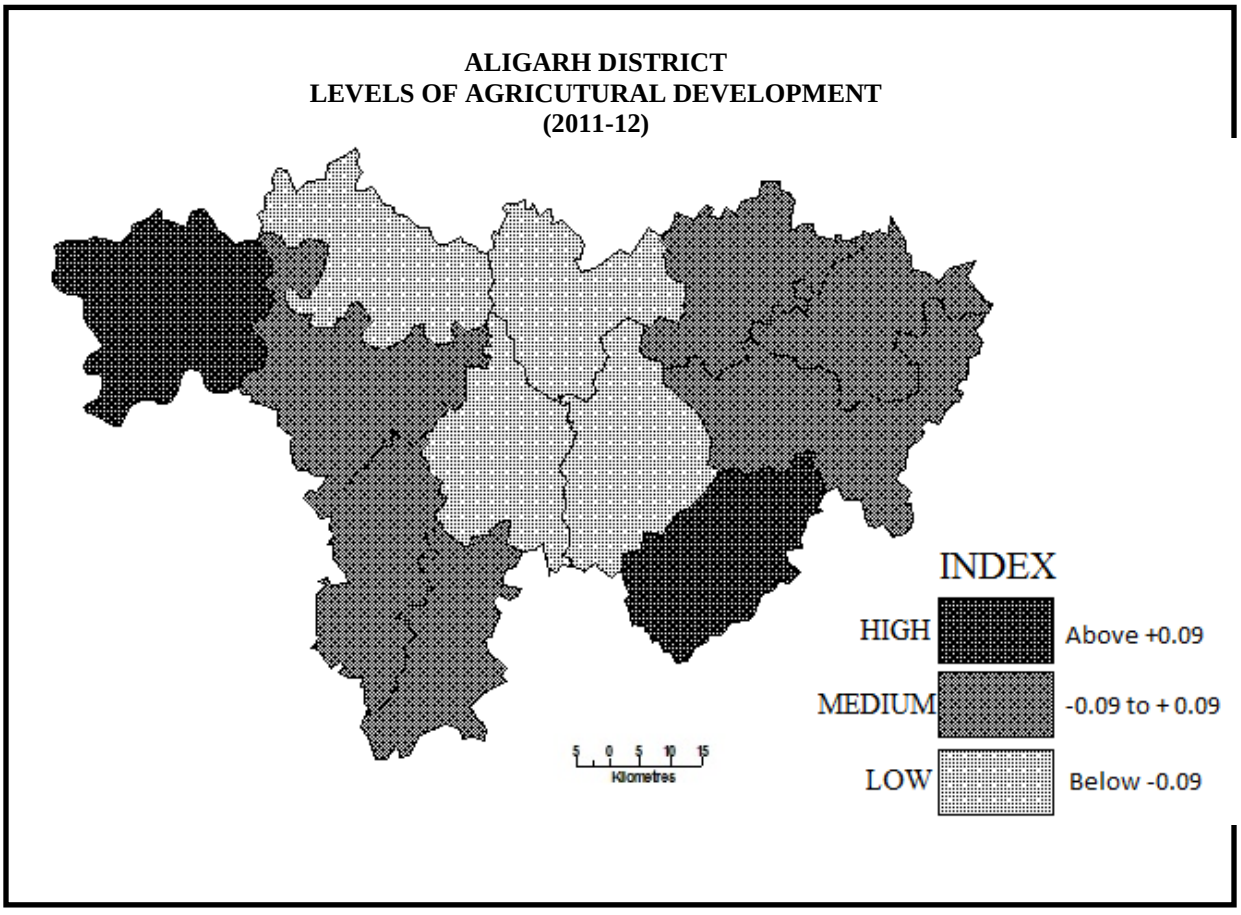

Fig.2 Block wise Levels of Agricultural Development based on Composite Standard Score

III. Conclusion

The above analyses of level of regional disparities clearly indicate that the level of agricultural development is not uniform in the study region. The study highlights that the majority of the district come under the medium category of agricultural development which covers the north-eastern part of the region. It is clear that Chandaus,Jawan,Lodha,Dhanipur have witnessed low level of agricultural development due to low agriculture infrastructure facilities. The region, which have high level of agricultural development, are not need of any special effort, because already they have well developed facilities for agricultural development. But there is special attention at the time of floods in Tappal block which is located at the bank of Yamuna River and not excess use of chemical fertilizers in high category of blocks. Nevertheless, in blocks which have low level of agricultural development, need special attention to irrigation facilities developed like tube well, canal irrigation etc., awareness of agricultural technical knowledge and proper use of fertilizers etc. So the level of agricultural development could be raised.

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