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# IMPACT ASSESSMENT OF SOCIO-ECONOMIC STATUS: A CASE STUDY ON MOHAMMAD BAZAR BLOCK OF BIRBHUM DISTRICT, WEST BENGAL

**Mr. Sukanta Mandal[*1] Mr. Sujay Dutta[2] Mr. Anagh Chatterjee[3]**
[1]*Research Scholar, Department of Geography Raiganj University*
[2]*Faculty Dept. of Geography, THLH College*
[3]*Dept. of Civil Engineering, MSIT*

**ABSTRACT**

***Impact assessment is a means of measuring the effectiveness of organizational activities and judging the significance of changes brought about by those activities. Impact is a measure of the changes made, and impact assessment seeks to establish a causal connection between inputs and changes in terms of magnitude, scale, or both. Understanding the socioeconomic status of a geographic region is required to assess the impact of agricultural land use and workforce participation in that region. Mohammad Bazar is a community development block; there are 138 villages that are inhabited and 20 villages that are uninhabited among them. Agriculture is the key pillar of the economy in MD Bazar CD Block. However, the research area's principal crops are Aman and Aus paddy. Besides these, the area is cultivated with a good number of other crops like wheat, mustard, potato, til, tomato, etc. However, the study area's production varies depending on local physiographic characteristics (soil depth, texture, available nutrients, human interactions, rainfall, temperature, and so on). This research paper aims to focus on how LU/LC dynamics over the past twenty years have had a deep impact on the livelihood status of the study area.***

**KEY WORDS:** ***Impact assessment, LU/LC dynamics, Agriculture, Mining***

## INTRODUCTION

The research site, Mohammad Bazar C.D. Block (23˚ 56′ N-24˚ 06′ N and 87˚27′ E - 87˚40′ E), is situated within the western part of the Birbhum district of West Bengal. It has a common boundary with Raniswar C.D. Block in the district of Dumka, Jharkhand within the west section of the research site, while the northern and southern boundary is usual with Rampurhat-I and Suri-I C.D. Block respectively. Similarly, the eastern part is in common with Mayureswar-I and Sainthia C.D. Blocks. The total coverage of the study area is approximately 315.64 square km in size. As per the 2011 Census of India, Mohammad bazar had a total population of 3,090 of which 1,545 (50%) were males and 1,545 (50%) were females. MD Bazar C.D. Block is physiographically a part of the Rarh region of the western part of the West Bengal. The western portion of the region is basically an extension of the Chotonagpur gneissic complex and is characterized by moderately dissected undulating terrain. Mohammad Bazar C.D. Block is partly in the Dwarka-Mayurakshi inter- fluve. This Paper aims to focus on how LU/LC dynamics of twenty years effect on work force participation, fluvial processes and agricultural status of the MD Bazaar C.D. Block.

## OBJECTIVES

objectives have been incorporated to fulfill its original dimension:
(A) To analyze the socio-economic status of the study area.
(B) To analyze the physiographic characteristic of the study area.
(C) Find out the status of educational status and literacy rate.
(D) Try to find out the status of agricultural land use and workforce participation.
(E) To find out major findings and give some suggestion.

## METHODOLOGY

Any research work can be done based on following methodology:

Firstly, author has selected the study area and prepares base maps for the study area for various purposes. Author have been prepared contour maps, slope maps etc. on the basis of information from Topographical maps of 72P/12 issued by the Geological Survey of India (GSI) with the help of remotely sensed data.

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Secondly, the author has tried to identify the problems and collect various data to prepare the land use maps related to forestry, irrigated land, cultivable land, waste land etc. The author also prepared the thematic maps related to the percentage of cultivators, agricultural labourer, literacy, schedule tribe, schedule caste etc. The occupational structure maps showing the percentage of main workers, agricultural laborers, cultivator and non worker participation in 1991 and 2011 census have been prepared to show the changes over times.

Thirdly, author has made a field survey because without the knowledge of intense field survey impact assessment of land use land cover not possible.

## PHYSIOGRAPHY

MD Bazar C.D. Block is physiographically a part of the Rarh region of the western part of the West Bengal. The western portion of the region is basically an extension of the Chotonagpur plateau fringe or Chotonagpur gneissic complex and is characterized by moderately dissected undulating terrain. Mohammad Bazar C.D. Block is partly in the DwarkaMayurakshi inter- fluve. The greatest altitude of the study area is 60 meters in the north-western and western plateau border regions, while the minimum altitude is less than 10 meters in the eastern half of the alluvial plain, according to this contour map (Fig.1) more than 80% of the research area is bounded by 20-30 meters of contour lines. The whole study area is characterized by moderate slope. The highest elevation is above 30 degree found in the western part of the study area; on the other hand lowest slope value found in the extreme eastern part of the MD Bazar C.D. Block.

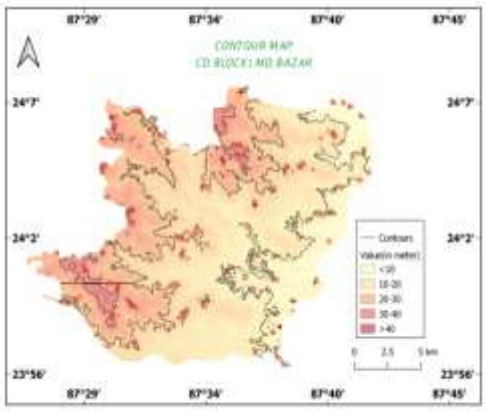


**Fig1: Contour Map**

## GEOLOGY

MD Bazar C.D. Block is an elongated part of Chotonagpur plateau fringe zone. Western and some part of the north-western portion of the study area is falls under Chotonagpur Gneissic Complex (CGC) and Rajmahal trap zone of Birbhum districts. Rajmahal trap area is one of the older geomorphic units of the middle-east India both the perspective of geography and morphological inquiry .Rajmahal highlands are narrate as the concrete base for the study of geology in Indian adherence. Western part of the study area has earliest archean to recent quaternary rocks and sediments. One of an important event in the study area is the volcanic eruption which makes Rajmahal traps or Rajmahal highland. Such a huge volume of basaltic magma on the continental crust has vivid effect on crustal evolution. The Rajmahal series made by 610 meters thick bedded basalts with about 30.5 meters inter-trappean beds consisting of siliceous and porcellanoid carbonaceous clays and sandstones. These intrusive, abundant in the lower Gondwana rocks, have often damage the coal seam near their contacts. The CGC constitutes the oldest litho units of south western Bengal and exposed in the western and north western part of the district.

## DRAINAGE

Mayurakshi river originates in Jharkhand's Santal Pargana and enters Birbhum at Haripur village at 70 meters height before leaving the study area at Katunia village at almost 30 meters elevation. On the study area, it runs for roughly 11 kilometers. Mayurakshi runs through the study area's south-eastern corner. Mayurakshi is known as "MOR" among the local community. Dwarka River, like Mayurakshi, is an ephemeral river in nature. This river also originates on the Chotonagpur plateau (23.0000° N, 85.0000° E) in Santhal Pargana and runs through the study area's northwestern and centre east. This river flows in a zigzag pattern for roughly

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17.5 kilometers across the MD Bazar C.D. Block. Bhola and Gharmora on the left bank, and Kulia on the right bank, are three significant tributaries of the river Dwarka.

## SOIL

The Rajmahal uplands, or the western most half of the research region, are dominated by laterite soils of volcanic origin; low-level laterites are common. In the western half of the research region, the lateritic deposit exists as a cap rock over the basalts and tertiary formations, covering the majority of the study area. The northern section of the research area is covered in forest soil. Ganpur reserve forest, located in the northern section of the research area, is important in the production of forest soil. Older and younger alluvium of river deposition covers the eastern section of the research region. The neighboring alluvium soil gets moist due to seepage. This region's alluvial soil is rich in nutrients and has a high water retention capacity, both of which are critical for agricultural output.

## NATURAL VEGETATION

Mohammad Bazar C.D. Block's vegetation is mostly divided into two types and zones. One is linked to the undulating terrain in the western part of the study region, while the other is linked to the flat alluvial plain in the south and southeast. Gully and sheet erosion are especially common in the western section, making the soils there quite poor in terms of depth, accessible water holding capacity, and plant nutrients. The vegetation in this region is semi-arid. Because of the nutrient-rich, very productive soils in the south and east, paddy planting is quite popular. In the northern and north-eastern parts of the research area, degraded forest are found in Chanda, Maubelia, Charicha, Chanpur, and Ghaga, as well as a thick forest at Ganpur. Vegetation / Plants in the forest are sal (Shorea robusta) as well as mixed varieties forest which includes khair (Acasia catechu), Mahua (Madhuca longifolia), Arjun (Terminalia arjuna), Palash (Butea monosperma) etc, are found.

## IMPACT ASSESSMENT AND DISCUSSION

**EDUCATIONAL INSTITUTION AND LITERACY:** Statistical analysis of census data reveals that educational institution has increased from 1991 to 2011. As well as comparative analysis of correlation indicates that literacy rate of the study area also has increased during the period. Increased rate of literacy has a positive impact on social structure because literacy improves the development of the wider community. Literacy reduces infant mortality rates because it directly affects individual's health and wellbeing. Literacy empowers women and girls, for now a day's women's education is vital for the betterment of the society. Following two sets of maps (Fig 2 & Fig 3) reveals that a large number of educational institutions has made by government or other authority during 20 years of time. Not only government but also many Nongovernmental organizations (NGO) also spent their time on this work. Many schools, computer center, private coaching center has made during this period at very remote villages such as Fullaipur, Srikantapur, Narasinghpur, Bhutura villages etc.

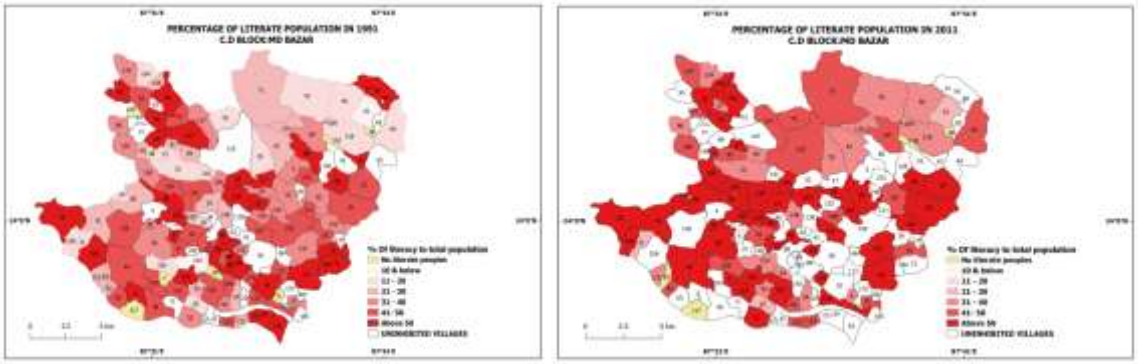


**Fig: 2 & 3 showing the change of percentage of rate of literacy**

## AGRICULTURAL LAND USE AND WORKFORCE PARTICIPATATION

The labor force participation rate, also known as the work force participation rate, is the percentage of the working population aged 16 to 64 that are presently employed or looking for work in the economy. Persons who are still undertaking research, homemakers, and people above the age of 64 are not included in the workforce (census of India). The phrase "main workers" was used for employees who worked for the majority of the year. Six months (183 days) or more were the majority of the year. On the other hand, according to the Indian Census, a person was considered a cultivator if he or she was employed as an employer, a single worker, or a family worker in the cultivation of land owned or leased by the government, a private person, or an institution for payment in cash, kind, or crop sharing. Cultivation involved cultivation monitoring or guidance as well. Agricultural labourers are people who work on other people's

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land for a living for the most of the year and earn a significant amount of their income as salaries for work done on other people's agricultural fields. Household Industry is defined as an industry conducted by one or more members of the household at home or within the village in rural areas. Those workers who had not worked for the major part of the year were termed as marginal workers, in other words who had worked for less than six month or 183 days (Census of India).

**Table:-1 Significance test table**

| ear | Significance test table | r | $r^2$ | calculated 't'= s/q | Tabulated *t* value | significance level at 0.01 | Remarks |
|---|---|---|---|---|---|---|---|
| 1991 | Total main workers vs total main cultivators | 0.81 | 0.66 | 17.32 | 2.60 | 99% | Null hypothesis rejected and alternative hypothesis accepted |
| | Total main workers vs total agricultural labour | 0.73 | 0.53 | 13.26 | | | |
| | Total main workers vs total household industry | 0.53 | 0.28 | 7.79 | | | |
| | Total main workers vs total other workers | 0.73 | 0.53 | 13.26 | | | |
| | Total main workers vs Total marginal workers | 0.56 | 0.31 | 8.37 | | | |
| 2011 | Total main workers vs total main cultivators | 0.59 | 0.35 | 9.17 | | | |
| | Total main workers vs total agricultural labour | 0.89 | 0.79 | 24.23 | | | |
| | Total main workers vs total household industry | 0.52 | 0.27 | 7.60 | | | |
| | Total main workers vs total other workers | 0.81 | 0.66 | 17.40 | | | |
| | Total main workers vs Total marginal workers | 0.81 | 0.65 | 17.02 | | | |

## DECLINED IN THE NUMBER OF CULTIVATORS

From 1991 to 2011, correlation statistics show that the relationship between the primary worker and the cultivator has deteriorated. The percentage of cultivators has decreased from 1991 to now, according to the findings. In 1991, the correlation coefficient was 0.81, however in 2011, it was 0.59, indicating significant drops in cultivator rates over the past two decades. There are a variety of causes for this trend, including shrinking average operating holdings, farming being unprofitable, rising agricultural salaries, widespread land sales, and a movement in employment from the agricultural to non-agricultural sectors. In support of it, the following two diagrams have been created.(Fig:)

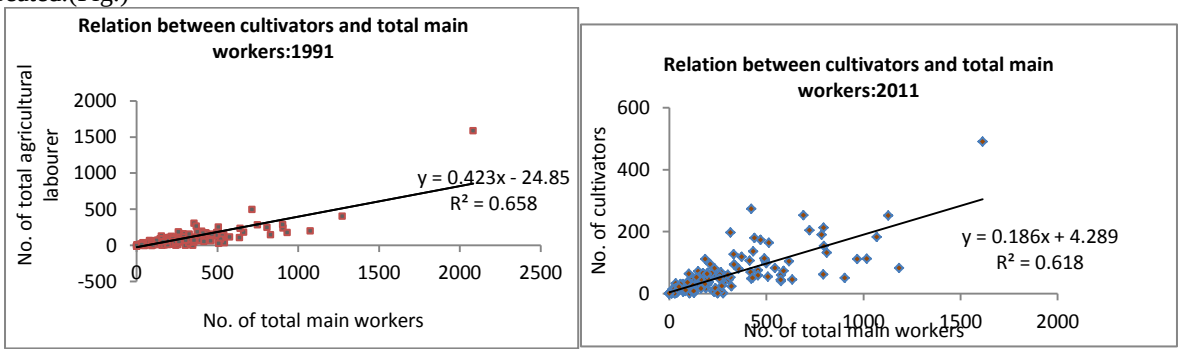


**Fig: 4&5 Showing the declination of number of cultivators**

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## INCREASED IN THE NUMBER OF AGRICULTURAL LABOURER

Correlation values indicate that the relation between main worker and Agricultural labourer has increased from 1991 to 2011. The result reveals that the proportion of cultivator's increases from 1991 to present. Co-relation value has increased in the year 2011 which depicts that an increased has occurred in last two decades from 0.73 to 0.89. Following diagram depicts the actual ground truth.

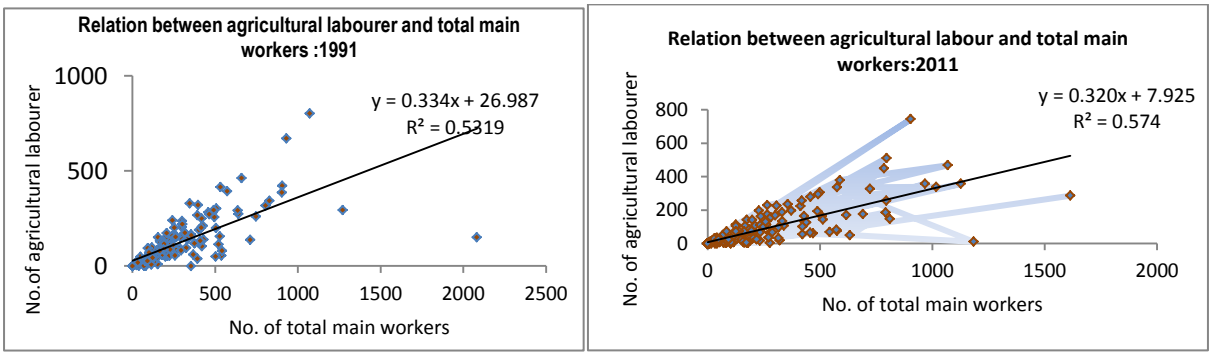


**Fig. 6 & 7 Showing the changing pattern of Agriculture and Labourer**

## INCREASE IN THE NUMBER OF OTHER WORKERS

The study area experienced a major increase in the number of other workers. Other workers are mainly engaged in non-agricultural background like mining, official jobs both governmental and non-governmental etc. Correlation values indicate that the relation between main worker and other workers has increased from 1991 to 2011. The result reveals that rate of contribution has increased in last two decades. There are many reasons for this development. This region is famous for basalt extraction; new mining areas help to increase the employment opportunity.

## IRRIGATION AND AGRICULTURAL PRACTICE

A number of changes in LULC have been found in the study area from 1991 to 2011. Village wise comparative study also has been done for the better understanding of the matter of fact. Table reveals that the changes in village wise irrigation facility. The villages which receive more irrigation water than past have converted cultivable waste land to mono cropped area that indicates a positive sign in agricultural aspect in other words agricultural productivity has increase during this period.

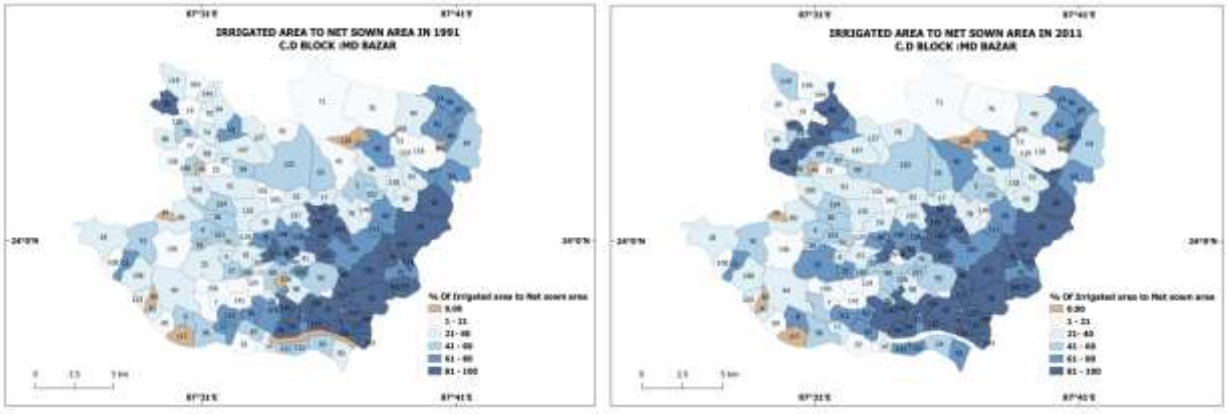


**Fig: 8 & 9 Showing changing pattern of irrigated area to net shown area**

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**Fig: 10 An example of Water-lift Irrigation**

## MINING AND RIVERINE SYSTEM

Mining industries have provided good number of employment and supported the economy in the study area. Mining has created a number of problems like it restrict the run off to meet the river channels. The depth of the mines when increases it forms local storage point for seepage water which supposed to meet the nearest channels. Therefore, the river flow faces problem in recharge process. A good number of basalt mines are caused to restrict the river flow at present. So we can say that the negative impacts in this study area are found like the damage of the riverine system due to mining. The numbers of agricultural laborers are increasing but the numbers of cultivators are decreasing. This situation rises for lake of interest on agricultural practices because of not gaining proper prices of their crop. There are some positive transformations that we can found in this area like increasing the number of educational institution as well as increasing the number of literacy rate in this study area.

## MAJOR FINDINGS

After the study or analysis of whole thing author has find something related to the matter of subject. Author has tried to find out some problems and as well as potentiality regarding the subject matter, in other words author has fixed the problems and potential aspect in the study area.

- Mining has created a number of problems like it restrict the runoff process and affect the stream flow system, air pollution in crasher area, health issues in laborer etc. The depth of the mines when increases it forms local storage point for seepage water which supposed to meet the nearest channels. Therefore, the river flow faces problem in recharge process. A good number of basalt mines are caused to restrict the river flow at present.
- The percentage of cultivators has decreased from 1991 to now, according to the findings. In 1991, the correlation coefficient was 0.81, however in 2011, it was 0.59, indicating significant drops in cultivator rates over the past two decades. There are a variety of causes for this trend, including shrinking average operating holdings, farming being unprofitable, rising agricultural salaries, widespread land sales, and a movement in employment from the agricultural to non-agricultural sectors.

**PLANNING AND PROPOSAL:** Uniform distribution of Net Sown Area at village level is quite unusual as well as the irrigation facility. In general distribution of NSA and irrigated area shows positive relationship with some deviation. The regional disparities in the distribution of irrigation facility influence the crop output in a region which in turn causes regional development disparity in a area which is dominated by agricultural activities specially crop cultivation. The villages having higher concentration of NSA may have less irrigation facility. Therefore, planning for irrigation facility on the basis of priority at village level requires deviation analysis between the distribution of NSA and the same parameter. Hence, an attempt has been taken in this work to show the relationship between Net sown area and irrigation area by using correlation co-efficient. To justify the significance of these two parameters T test can be applied. Z- Score can be used to analyze the deviation fourth quadrant basis.

The distribution and deviation of NSA has been analyzed on the basis of census data 2011. Uneven distribution of NSA is measured by z-score. The z-score value for each village can be +1 or -1 and >1 or <1.

$$\text{Z score} = \frac{(x-\bar{x})}{\delta}$$

There are some similarity and dissimilarity in the distribution of the Net sown area and irrigated area found by analyzing the standard deviation and Z- Score. Some important observations have come out which are as follows:

The significance of the correlation coefficient is tested by‘t’ distribution (with n-2 degree of freedom) where at the 99.9% confidence level the calculated value of ‘t’ is 2.69, quite higher than the tabulated value (2.61) with *d.f.* 156. Therefore, null hypothesis ($H_0$) is rejected and alternative hypothesis ($H_a$) is accepted at a significance level of 0.001 and it reveals that there is a positive relation between NSA and irrigated area in the selected study area.

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Correlation (r) of Z-Score values of between the NSA and irrigated area is 0.21. The difference between the mean and standard deviation values of the net sown area and irrigation area are 9 (63~54) and 11 (22~33) respectively. The result shows the regional disparities exist prominently. Therefore, in the study area planning for irrigation is more important.

The villages that have positive values and if it more than 1that indicates those villages have net sown area more than the average and irrigation facilities too.

The value less than 1 but positive that indicate well conditions than the less than 1 negative value.

The villages of 1st quadrant are most agriculturally advanced in regional aspect. 30% villages are relatively developed in respect of the total villages of the study area (Fig. & table).

The villages of 2nd quadrant represent positive change in net sown area and negative change in irrigation. So this quadrant is characterized the under developed agricultural region. 27% villages are under this category. If irrigation facilities increase then net sown area will be increased (Fig.).

Villages of the 3rd quadrant are characterized by negative deviation of net sown area and irrigated area both. There are 27% villages which regionally lagging behind to the maximum (Fig.).

The villages of 4th quadrant are needed planning for net sown area because here net sown area negatively but irrigation positively deviated from the mean value. Only 16% of villages are under this category out of the total 158 villages (Fig.).

The facility of irrigation depends on the availability of river water, pond, ground water, etc. nearness from the source of irrigation water controls the abundance of irrigation water. There is a huge range in irrigated area varies from 0% to 100 % to the NSA. The deviation of the irrigated area has been analyzed by mean, standard deviation and jointly by z-score. The highest deviation is found more than 1.3 times than the standard deviation and the lowest deviation is less than 0.01 times. On the basis of z-score it can be mentioned that some of the villages have positive and as well as negative deviation.

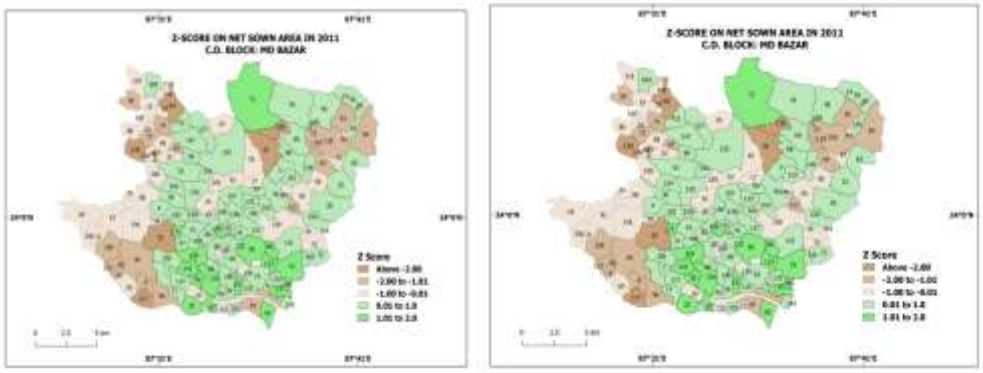

**Fig. 11 & 12 Z-Score on net sown area in the year 2011 & 1991**

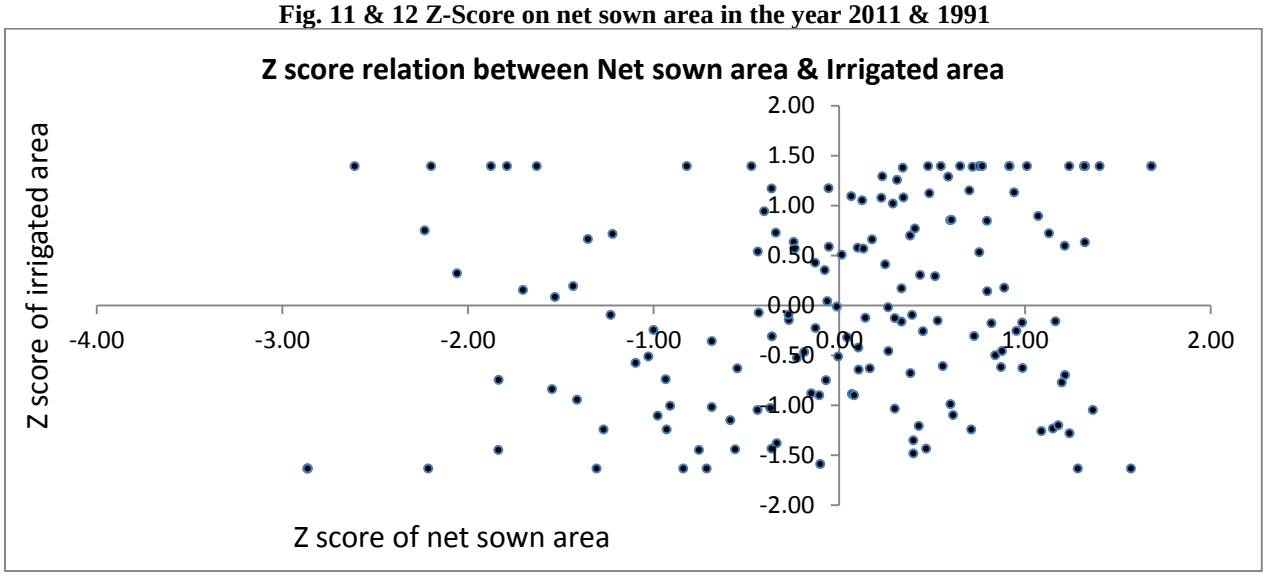


**Fig. 13 Z-Score relation between Net sown area & Irrigated area**

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**Table 2: Identified villages required planning for irrigation and net sown area**

| Year 2011 | No. of villages | % of villages | Need plan for irrigation | Need plan for net sown area |
|---|---|---|---|---|
| 1st Quadrant | 48 | 30 | | |
| 2nd Quadrant | 42 | 27 | J. L. No. 1,3,4,5,6,7,8 ,9,11,12,14,15,16,18,20,21,22,24,25,26,27,28,29,30,33,3435,36,44,48,51,81,102,105,108,110,116,117,124,127,145,146,147,148,149,150,151,152,153,154,155,156,157,158 | |
| 3rd Quadrant | 43 | 27 | | J. L. No.8,16,17,18,19,21,24,26,29,30,33,35,38,42,43,44,48,49,50,52,53,55,57,58,60,64,65,67,70,74,77,81,82,83,84,86,87,89,90,91,94,96,97,100,105,106,108,110,111,114,117,118,120,121,122,123,126,130,134,136,140,144,146,155,158 |
| 4th Quadrant | 25 | 16 | | |

The overall analysis reveals that only 27% of the villages are getting sufficient irrigation water (more than 80% to the net sown area). The villages located in the eastern side of the Block having a high net sown area (NSA above 80% of the total area). River lift irrigation plays a vital role for the crop cultivation. Spring recharged streams are the main sources of water for irrigation.

## CONCLUSION

In Mohammad Bazar Block, the natural and cultural environments are uniquely linked. The physical environment always has an impact on the manner of life of the locals as well as the local economy. Lack of some infrastructure amenities is to some extent a hindrance to economic progress. Careful planning along with the use of contemporary science and technology in a variety of economic areas can lead to the village's integrated growth. The growth of the area's rural community may be aided by the sustainable use of natural resources.

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