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# Utility of GIS Tools for Spatial Dimension of Poverty- A Case Study of Pratapgarh Block in Rajasthan

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**Abstract**

GIS has evolved out of a long tradition of map making. In many respects, modern GIS dramatically increase the amount of information that can be contained and manipulated in a map. On the other hand, many of the same cartographic conventions and limitations apply to digital maps. Like all models, maps are, by necessity, simplified representations of reality. Partly, this is for convenience; it becomes very difficult to draw and interpret multiple information themes on one map covering more than a very small area. Before computers became widely available, thematic maps on plastic Mylar sheets could be laid on top of each other, revealing more information about an area than was possible with any single paper map. Ian McHarg's classic landscape architecture text, Design with Nature, advocated a rational approach to site planning (which he termed physiographic determinism) by creating Mylar overlays depicting landforms, soil types, vegetation patterns, and geomorphic features. Although the process was cumbersome and the amount of data limited, McHarg's method looks remarkably like the output of contemporary GIS; colored thematic maps were generated that aided in planning. However, as Burrough and McDonnell note with all of these early systems: "The paper map and its accompanying memoir was the database". There could be no database of information directly linked to the map and no automation of spatial querying.

The paper is a case study of Pratapgarh block in the Pratapgarh district of Rajasthan. Designed on both the secondary and the primary data it aims at exploring GIS tools which are helpful in studying the various dimensions of poverty. The findings reveal that remote sensing is the best and most appropriate GIS tool for the dimension of poverty.

**Keywords:** GIS, Tools, Spatial, Dimension, Poverty, Case Study, Block.

**Introduction**

Poverty is the scarcity or the lack of a certain (variant) amount of material possessions or money. Poverty is a multifaceted concept, which may include social, economic, and political elements. Condition where people's basic needs for food, clothing and shelter are not met is poverty which is generally of two types, namely, absolute poverty and relative poverty. Absolute poverty is synonymous with destitution and occurs when the individual cannot obtain adequate resources to support a minimum level of physical health, while relative poverty occurs when the individual does not enjoy a certain minimum level of living standards as determined by a government.

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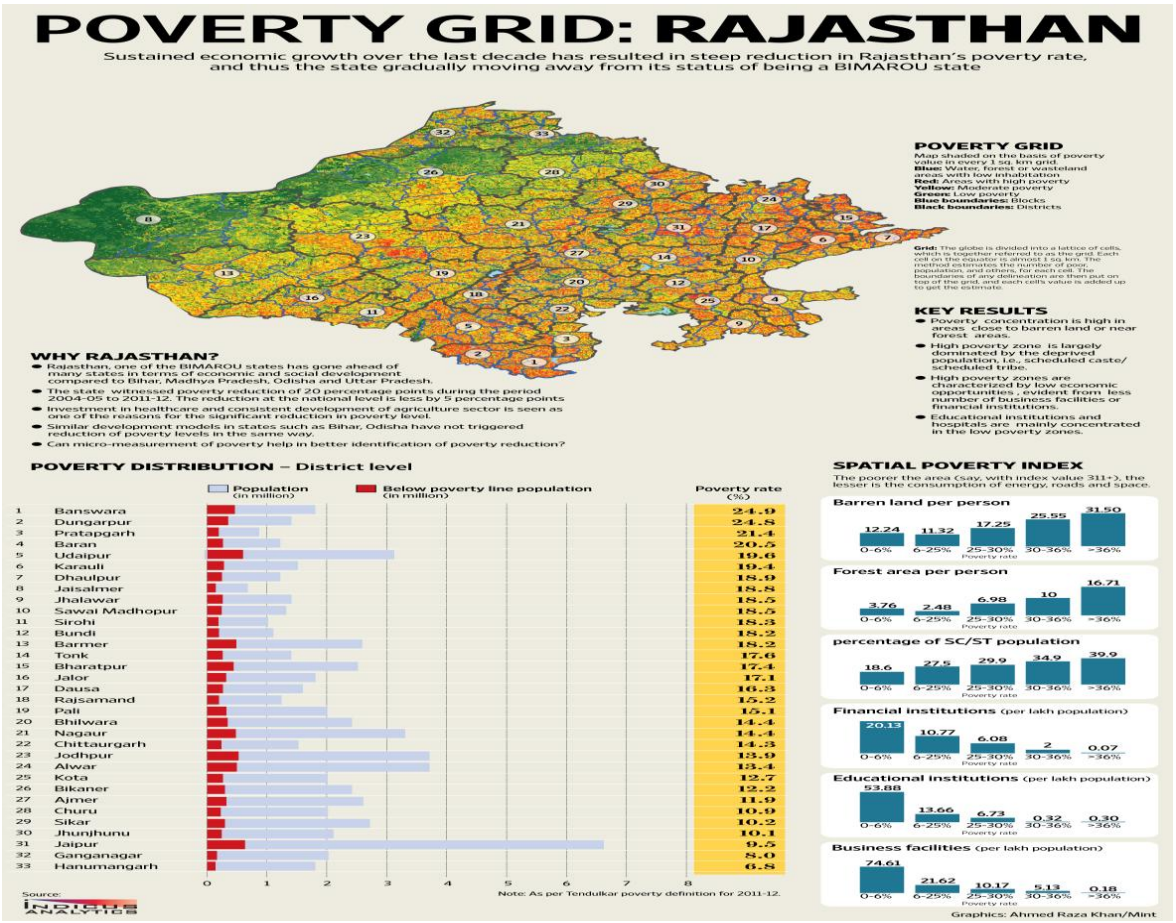


**GIS: A Historical Perspective**

GIS technology evolved through multiple parallel but separate applications across numerous disciplines. The development of the GBF-DIME files by the U.S. Census Bureau in the 1960s marked the largescale adoption of digital mapping by the government. This system led to the production of the Census TIGER files, one of the most important socioeconomic spatial data sets in use today. A grid-based mapping program called SYMAP, developed at the Laboratory for Computer Graphics and Spatial Analysis at the Harvard Graduate School of Design in 1966, was widely distributed and served as a model for later systems. These early GIS packages were often written for specific applications and required the mainframe computing systems found usually in government or university settings. In the 1970s, private vendors began offering off the-shelf GIS packages. M & S computing (later Intergraph) and Environmental Systems Research Institute (ESRI) emerged as the leading vendors of GIS software. In 1981, ESRI released Arc/Info, a standard package which ran on mainframe computers. As computing power increased and hardware prices plummeted in the 1980s, GIS became a viable technology for state and municipal planning. In 1992, ESRI released ArcView, a desktop mapping system with a graphical user interface that marked a major improvement in usability over Arc/Info's command-line interface. By the early 1990s, GIS initiatives existed in all fifty states. In the late 1990s, GIS was adopted slowly on the sub-municipal level by neighborhood organizations and community-based agencies. The development of ArcView for Microsoft Windows and ArcIMS, which enables distributed mapping and spatial analysis over the Internet and eliminates many of the hardware and licensing expenses of a full software package, has increased the availability of spatial data to marginalized and under funded groups. Although access to both GIS software and spatial data sets has improved, the adoption of GIS as a planning or research tool still represents a significant commitment by community organization. From the early 1960 to till now the computerized GIS is developed, enhanced and used in different fields of science and arts for the urban and rural development in government and private sectors. GIS is now a popular tool which is being used in almost every field of science and arts. It is not confined only to a few countries but has reached across the world. Agriculture, irrigation, soil management, Geology, Geomorphology, land information system, natural hazard management, urban planning, environment, health, natural resource management, human resource development etc. are some of the popular fields where a successful application of GIS and Remote Sensing is made. It will not be an exaggeration to say that every researcher belonging specifically to these adopts GIS and Remote Sensing for the purpose of study of the problem in consideration.

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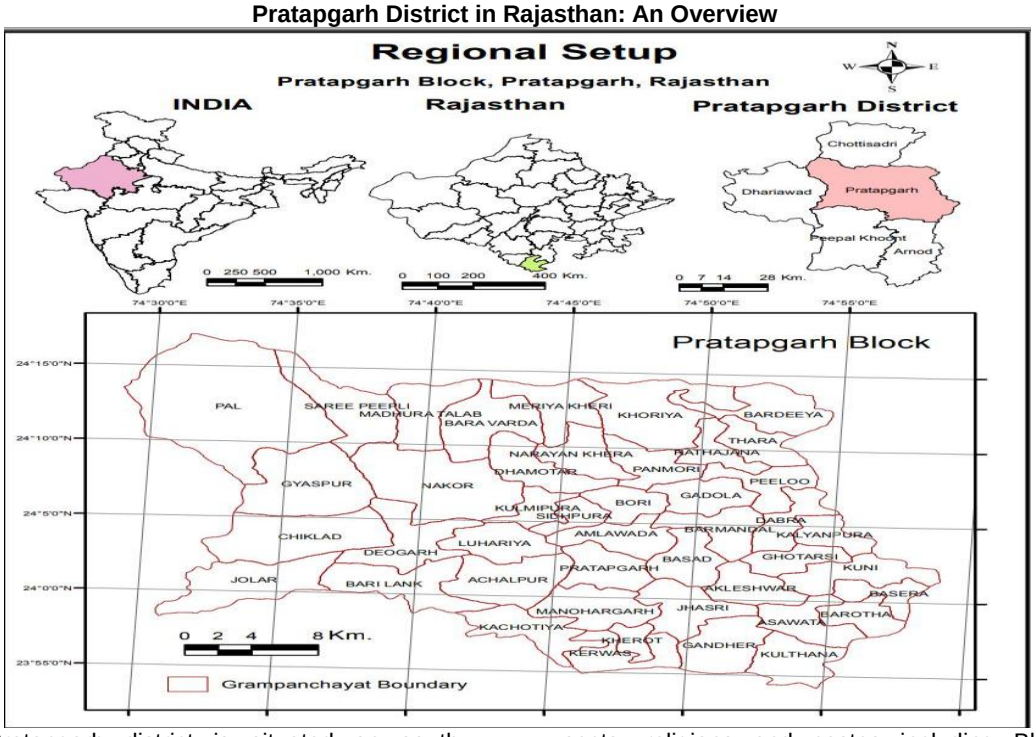
**Pratapgarh District in Rajasthan: An Overview**




Pratapgarh district is situated on south-eastern part of the state. The area adjoins Udaipur, Banswara and Chittaurgarh districts of Rajasthan and Ratlam, Mandsaur and Neemuch districts of Madhya Pradesh. It is situated in the junction of the Aravalli mountain ranges and the Malwa Plateau; hence the characteristics of both prominently feature in the area. It is located between 280 42' 33" and 300 12' 16" north latitude and between 720 39' 33" and 740 17' 51" east longitude. Pratapgarh is the 33rd district of Rajasthan, came into existence on 26 January 2008. Pratapgarh district is one of the six districts, those comes under Udaipur division. District Collector is head of the district for revenue, Law and order matters. District Collector & District Magistrate is the head of District Administration. For administration and development, the district is divided in Sub Divisions and tehsils (sub-districts). The District Pratapgarh has 5 sub-divisions. Each of the sub-divisions is headed by a (SDOs) responsible for implementation of law and order There are 5 Tehsil headquarters in Pratapgarh district and each one has a Tehsildar as an administrative officer who works in accordance with the Land Record System to serve for the rural farmers and land holders and is responsible for maintaining the revenue matters in their respective tehsils. For the purpose of the implementation of rural development projects/ Schemes under Panchayati Raj System, the district is divided in the 5 Panchayat Samitis (Blocks). Adhikari is the Controlling Officer of each of the Panchayat Samiti to serve as extension and developmental executive at block level.

Rich in natural beauty and an ideal blend of Malwa, Mewar and Vagad cultures, Pratapgarh known in earlier times as 'Kanthal', is surrounded by Udaipur, Banswara, Chittaurgarh districts of Rajasthan and Ratlam, Neemuch and Mandsaur districts of Madhya Pradesh (MP). The district includes members of all sects, religions and castes including Bhil, Balai, Bhanti, Dhholi, Patidar, Rajput, Brahmin, Mahajan, Sunar, Darzi, Chamar, Luhar, Suthar, Nai, Dhobi, Koli, and above all Mina; major occupants are traditional Meena tribes, exclusively dependent on agriculture, animal husbandry and forestry, who have their own culture, attire, dialect, rituals, fairs and festivals. A good number of native Bohra families are engaged in overseas trading and business in Middle East countries.

**Review of Literature**

Bryant (2010) examined the effect of using a Collaborative Inquiry Model (CIM) model during professional development on the rate of effective GIS implementation in K-12 classrooms. According to the study the barriers to implementing GIS in the geography classroom include lack of curriculum, support, and access to local data. The teachers that do use GIS in their classroom often use the program as a digital atlas instead of as a tool for geographic inquiry. As part of the CIM model, teachers became members of an online professional support network, participated in a summer in-service program, and developed locally relevant, inquirybased curriculum utilizing GIS for the classroom.

Rajasthan Report.indd - UNDP in India (2012) says that framework reflects the interplay among three *dimensions* – the three levels at which 9 Organizing training need *analysis* (TNA) and training impact assessment. The governments in the state have become *tools* for *poverty* reduction and form .. while the middle level comprises of Panchayat Samitis (PS) at the *block* level.

Romanee Thongdara & Others (2012) investigate the potential of descriptive statistics, the geographic information system (GIS), and spatial autocorrelation in recognizing poverty association of a site selected in the northeast Thailand, including

identifying factors that influence rural poverty, and investigating underlying factors and spatial associations of poverty at the rural household level. Results showed that 70% of the households sampled in the study area were poor, and nearly half of their income generated was from farming. Factors influencing farm income were examined by regression statistics and it was found that farm income is related to area cultivated, rice yield, livestock and learning experience of farmers. It was demonstrated that GIS is a useful tool to identify environmental factors that influence poverty and spatial autocorrelation is an effective method in revealing similarities and dissimilarities of poverty in household units. Use of these two technologies to identify factors underlying rural poverty was analyzed and possible use of the findings in poverty alleviation programs was presented.

Tiwari and Tewari (2012) examined the role of GIS as a specific subject area in three major national boards of education in India. While there is some standardization in the core curriculum at private and public schools associated with these national boards of education, the role of GIS is still limited to its use as a pedagogical tool among private schools that mostly cater to elite populations in major urban centers across India. Despite a growing demand for GIS skills, its inclusion as a core component of secondary education remains unfulfilled due to a variety of reasons. They identified some of the key challenges that secondary schools across the country face in adopting GIS and its associated technologies as part of their core curriculums. They also identified specific opportunities for GIS education at secondary school level in India.

Komlenovic, Manic and Malinic (2013) investigated on the application of new educational technologies in geography classes. The results indicate that out of several ICTs available, the majority of students are familiar with the GIS, but only one third can be said to have theoretical knowledge and practical skills for its effective implementation. Students who use the GIS stated that it is a useful tool that contributes greatly to the development of cartographic skills, which is a major advantage given the problem-oriented learning approach, and that it is highly interactive, systematic and precise. These findings suggest that the GIS and other ICTs are still not fully used and that teacher presentation remains the dominant method, which includes less innovative didactic aids.

Bidyadhar Dehury and Sanjay K. Mohanty (2015)'s study estimates and decomposes multidimensional poverty in 82 natural regions in India using unit data from the Indian Human Development Survey (IHDS), 2011–12. Multidimensional poverty is measured in the dimensions of health, education, living standard and household environment using eight indicators and Alkire-Foster methodology. Results indicate that 43% of India's population are multidimensional poor with large regional variations. The average intensity of poverty was 45.5% with a MPI value of 19.3. Six states in India—Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha and West Bengal who have a share of 45% of the total population—account for 58% of the multidimensional poor. Across regions, more than 70% of the population are multidimensional poor in the southern region of Chhattisgarh and the Ranchi plateau, while they comprise less than 10% in the regions of Manipur, Mizoram and Chandigarh. The economic poor have a weak association with health and household environment dimensions. The decomposition of MPI indicates that the economic dimension accounts for 22%, the health dimension accounts for 36%, the education dimension accounts for 11% and the household environment accounts for 31% of the deprivation. Based on these analyses, the authors suggest target based interventions in the poor regions to reduce poverty and inequality in India.

Tomaszewski, Vodacek, Parody and Holt (2015) assessed the Spatial Thinking Ability of Rwandan Secondary Schools students. The Spatial Thinking Ability Test (STAT) of Lee and Bednarz's was modified and used for assessing 222 students from our rural and urban schools. Statistical analysis revealed that urban school students outperformed rural test school students and that males outperformed females.

Laura Paterson & Ian N. Gregory (2018) comment that GIS is a highly effective and well-established way of representing quantitative data, but it is thought to be unsuitable for unstructured textual data. However, a bridge can be built between GIS and texts using techniques from Natural Language Processing.

ArcGIS Desktop (2018) says that ArcGIS is a geographic information system (GIS) for working with maps and geographic information. It is used for creating and using maps, compiling geographic data, analyzing mapped information, sharing and discovering geographic information, using maps and geographic information in a range of applications, and managing geographic information in a database. The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the Web.

**Objectives of the Study**

1. To study the scenario of poverty in the Pratapgarh block of the Pratapgarh district of Rajasthan
2. To find out the causes and effects of poverty in the study area
3. To study the role of HRD deptt. in the rooting out of poverty
4. To explore and study the various tools and techniques adopted by the geographers for the geographical study
5. To explore the various tools that can be helpful in the spatial study and measurement of poverty in the specified area
6. To explore the GIS tools and techniques that can be helpful in exploring the dimensions of poverty
7. To work out the various dimensions of poverty in the study area
8. To spot the villages in the study area which have the higher rate of poverty

9. To spot the villages in the study area which have the lowest rate of poverty

**Hypothesis**

1. The Pratapgarh block of the Pratapgarh district of Rajasthan is in the grip of poverty
2. Illiteracy, unemployment, ignorance and lack of job opportunities are responsible for the poverty in the district
3. A spatial study and analysis of poverty in the area needs to be made
4. GIS tools are the best tools for the study and analysis of the dimensions of poverty
5. GIS tools are capable of enabling the geographers to analyze poverty genuinely
6. Poverty in the study area is controllable
7. Poverty in the block can be controlled under the planned schemes made by the government
8. Check on the poverty in the block will definitely raise the economic status of the people in the study area.

**Methodology**

Made with the specific aim to study the prevailing poverty in the Pratapgarh block in the Pratapgarh district of Rajasthan and to find out the GIS tools for the analysis of the dimensions of poverty, the study is empirical based chiefly on the primary data. However, the secondary data also find room in the study. The paper is the case study of the prevailing poverty in the Pratapgarh block in the Pratapgarh district of Rajasthan. With the help of the secondary data the researcher was able to peep into the depth of the problem, while the primary data helped the him produce an actual picture of the poverty. The tools used by the researcher for the analysis of the dimension of poverty in the study area include GIS Spatial analysis tool and ArcGis 10.2 in particular in addition to the traditional tools.

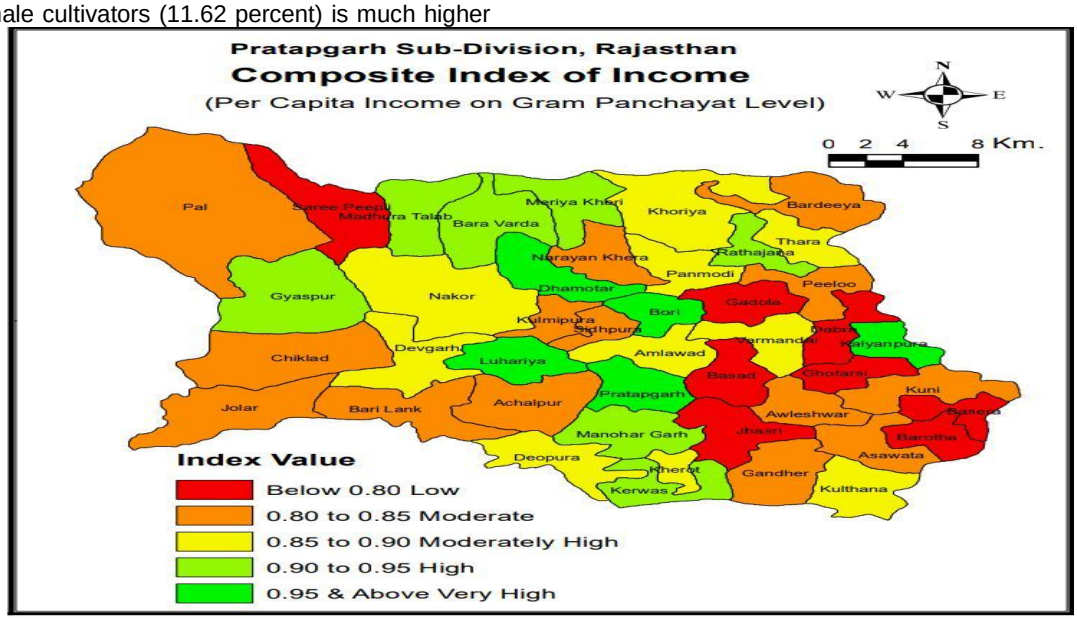
**Major Findings & Conclusion**

1. Pratapgarh district consists 91.7 percent rural and 8.3 percent urban population whereas the State percent of rural and urban population is 75.1 and 24.9 respectively.
2. The sex ratio of Pratapgarh district (983) is significantly higher than the State sex ratio (928).
3. The literacy rate in Pratapgarh district is 56.0 percent which is lower than the State Average (66.1 percent) and it ranks 31st among the other districts of the state.
4. Gender Gap of the literacy rate is 27.1 percent in the district.
5. The Scheduled Caste and Scheduled Tribe population in Pratapgarh district is 7.0 percent and 63.4 percent respectively whereas the State percent of Scheduled Caste and Scheduled Tribe population is 17.8 and 13.5 respectively.
6. The economy of Pratapgarh district is mainly dependent on agriculture as 83.8 percent workers in the district are either cultivators or agricultural labourers.
7. However the district percent of such workers is higher than the state average of 62.1 percent.
8. Work participation rate of Pratapgarh district has recorded 55.5 percent and gender gap in WPR is 4.1 percent points.
9. In Pratapgarh district among the workers the percentage of cultivators, agricultural labourers, workers in household industry and other workers are 63.7, 20.1, 1.1 and 15.1 percent respectively.
10. The highest percentage of scheduled castes population to the total population of respective towns/city of the district has been found at 16.82 in Chhoti Sadri (M) followed by 13.38 in Dhariawad (CT), while the lowest of 12.70 percent has been recorded at Pratapgarh (M).
11. As regards to scheduled tribes population Pratapgarh (M) has recorded the highest percentage of 8.22 to its total population while Chhoti Sadri (M) has recorded the lowest percentage of 4.35. Only 17 i.e. (1.75 percent) villages have no scheduled tribes population in the district.
12. Apart from these, it is significant to note that the majority of the villages i.e. 686 (70.72 percent) has been recorded on the higher side ranging 76 and above.
13. The literacy rate at the C.D. block level varies from the highest of 61.31 percent in Pratapgarh to the lowest of 40.95 percent in Dhariawad.
14. Among the males, the highest literacy rate of 77.04 percent has been registered by Chhoti Sadri C.D. block whereas the lowest of 53.89 per cent in Dhariawad C.D. block.
15. Likewise among females, the highest literacy rate of 46.20 percent has been registered in Pratapgarh C.D. block whereas the lowest of 28.39 percent in Dhariawad C.D. block.
16. The literacy rate of Scheduled Tribes at C.D. block level varies from the highest of 51.38 percent in Arnod to the lowest 36.5 percent in Dhariawad.
17. Among the males the highest literacy of 66.77 percent has been registered in Arnod C.D. block whereas the lowest of 49.46 percent in Dhariawad C.D. block.
18. Among the females the highest literacy rate of 36.26 percent in Arnod C.D. block whereas the lowest of 23.93 percent in Dhariawad C.D. block.
19. The highest gap in male/female literacy rate 31.05 percent registered in Chhoti Sadri C.D. block whereas the lowest 23.67 percent in Peepalkhoont C.D. block.
20. In the district, 55.46 percent of the total population comprises of total workers (main+marginal) and the rest 44.54 percent as non-workers.
21. Of the total workers (55.46 percent), 37.73 percent are as main workers and the rest 17.73 percent as marginal workers.
22. Sex wise, 57.50 percent of male population is that of workers whereas for females this percentage is 53.38.
23. At the tehsil level, Arnod tehsil has recorded the highest 60.05 percentage of total workers for males it is 61.56 percent and for females 58.53 percent. On the other hand, Dhariawad tehsil 66 has recorded the lowest 52.74 percentage of total workers; whereas for lowest in males it is 53.13

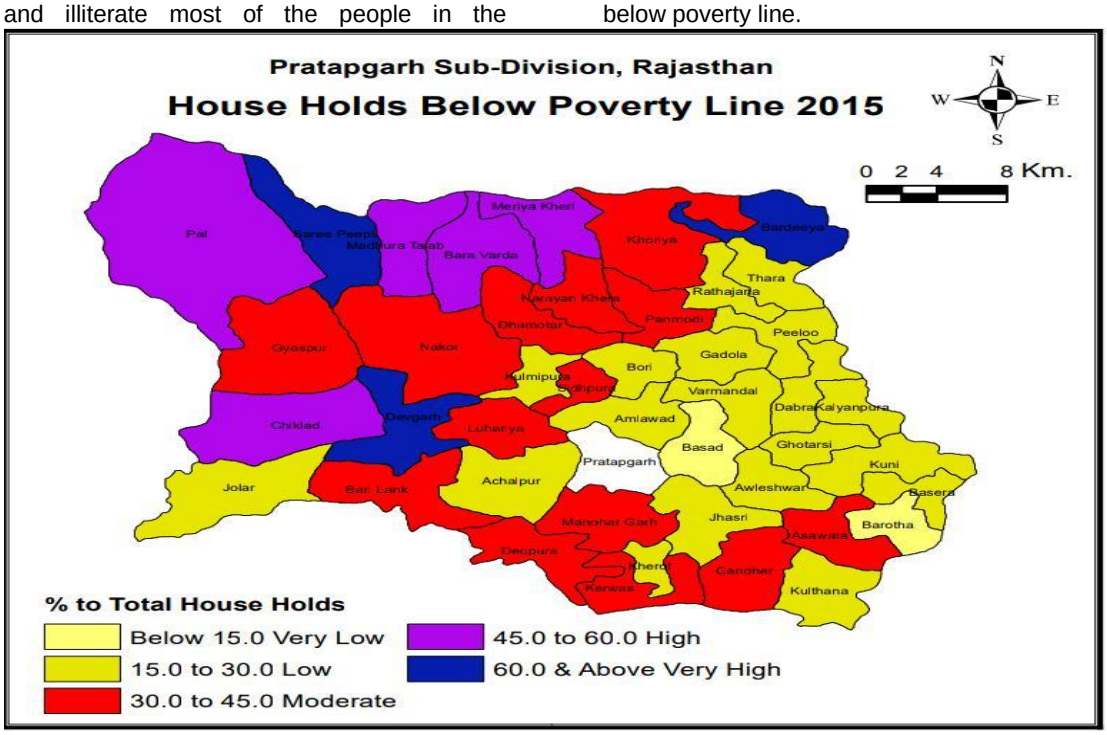
percent in Peepalkhoont tehsil and for lowest in females is 51.06 percent in Pratapgarh tehsil.

24. The percentage of workers to total population of urban areas is significantly quite low being only 36.72 percent as compared to that of rural areas of the district being 57.14 percent.
25. Sex wise percentage of male workers as other workers is higher than that of female other workers being 83.14 and 54.28 percent respectively. On the other hand, percentage of female cultivators (11.62 percent) is much higher than that of male cultivator's (6.81) at the district level for urban areas. Almost similar trend is visible in agricultural labourers and household industry workers where the percentage of female workers is higher than that of male workers.

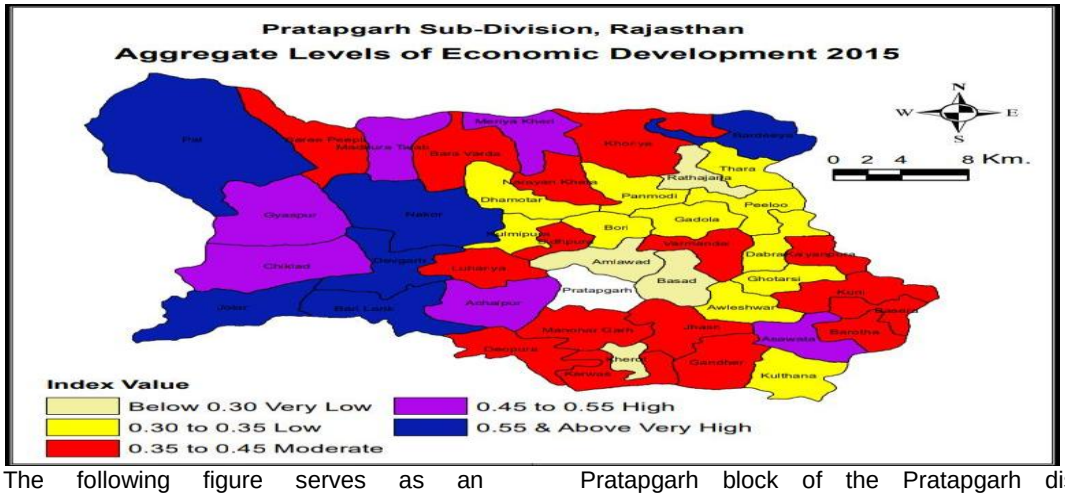
The following map reveals a horrible picture of the prevailing poverty in the Pratapgarh block of the Pratapgarh district of Rajasthan which is directly related to the low per capita income of the people who in the block.



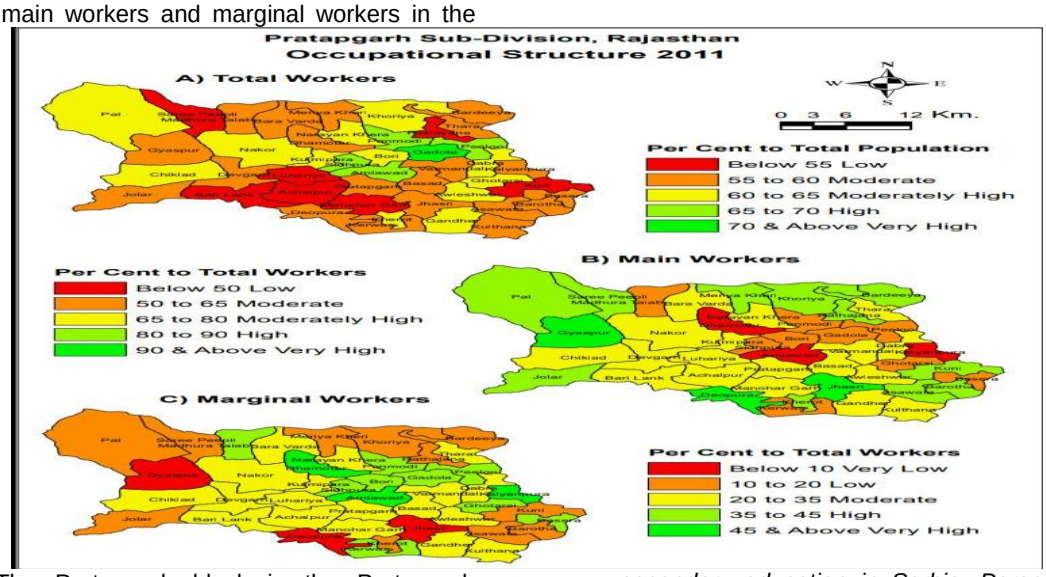

As displayed in the following figure, being tribal and illiterate most of the people in the Pratapgarh block of the Pratapgarh district are living below poverty line.




The following figure which is a display of the economic development in the Pratapgarh block of the Pratapgarh district in Rajasthan, projects a very low economic development in the block.




The following figure serves as an occupational structure and actual status of the total workers, main workers and marginal workers in the Pratapgarh block of the Pratapgarh district in Rajasthan.




The Pratapgarh block in the Pratapgarh district of Rajasthan has long been in a tight grip of poverty as a result of which many of the people in the block are living below the poverty line. The reasons of poverty in the block include illiteracy, unemployment, ignorance of the people, lack of job opportunities. The prevailing poverty causes several unexpected problems. A big percentage of the people is reported to be suffering from various types of diseases and have poor health that confirms a higher mortality rate in the area. The per capita income is low as a result of which the people are unable to maintain their families and health.

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