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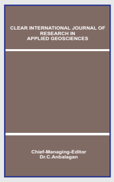

RAINFALL VARIABILITY STUDIES USING GIS IN OTTAPIDARAM TALUK, TITUCORIN DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

In the present study, an attempt has been made to understand the rainfall fluctuation study through GIS Technique. To achieve that aim, the rainfall year to year variations of the southwest monsoon (June to September) and northeast monsoon (October to December) rainfall over one of the The study area of Ottapidaram Taluk is the central part of Tuticorin District, south part of Tamil Nadu with an area about 743.62 km2 and is bounded by districts of Virudhunagar on the north, Ramanathapuram on the northeast, Tirunelveli on the west. This paper highlights the rainfall variation with respect to spatial distribution. The rainfall data for the period of 2002 to 2011 were collected in the Statistical Department. The rainfall was assessed with respect to the seasonal variation as winter, summer, northeast and southwest as well as average annual rainfall variation distribution. These results were taken into GIS platform, to prepare the spatial distribution maps. Last 10 years (2002 to 2011) monsoonal period was high rainfall noticed in Maniyachi, Killeral, Kayathar and Kadambur surrounding areas (southwest monsoon season 295.81 sq.km areas in moderate category, 274.39 sq.km areas in good category (above 700 mm), northeast monsoon season 416.60 sq.km areas in moderate class and 274.73 areas in good category).

Key Words: *Rainfall fluctuation, Monsoon, Ottapidaram Taluk, Spatial distribution*

INTRODUCTION

Water is the renewable resource and the percapita availability in India is fairly good. Titucorin district receives only two seasonal rains but sometimes the seasonal rainfall becomes inadequate. During such times the domestic, agricultural and industrial requirements are met by increased in subsurface water. The study of rainfall pattern is very important for the agricultural planning of any region. Monsoon depressions and cyclonic storms are the most important synoptic scale disturbances which play a vital role in the space – time distribution of rainfall over India (Sikka, 1977). Extreme precipitation events and its potential consequences such as floods and droughts have an essential influence on human life (Cook et al., 1999; Wanner et al., 2004; Xoplaki et al., 2001, 2004; Touchan et al., 2005). As precipitation is far more spatially variable than temperature, a greater density of stations is needed to assess precipitation patterns. However, most

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precipitation stations were only set up in the twentieth century.

GIS has emerged as a powerful technology for instruction, for research, and for building the stature of programs (Openshaw 1991; Longley 2000; Sui and Morrill 2004). GIS is an important technology for geologists (Baker and Case 2000).

STUDY AREA

The study area of Ottapidaram Taluk is the central part of Tuticorin District, south part of Tamil Nadu with an area about 743.62 km2 and is bounded by districts of Virudhunagar on the north, Ramanathapuram on the northeast, Tirunelveli on the west. The Ottapitaram taluk (Fig.1) lying between latitudes N 9°3’14” and 8°48’33” longitudes E 77°47’04” and 78°12’53” the major source for groundwater in the study area is rainfall during monsoon season.

METHODOLOGY

The daily rainfall data were collected from Statistical department, Govt. of Tamil Nadu and converted into average seasonal rainfall like winter (January and February), summer (March, April and May), South West (June, July, August and September), and North East (October, November and December) monsoonal rainfall. From this, the

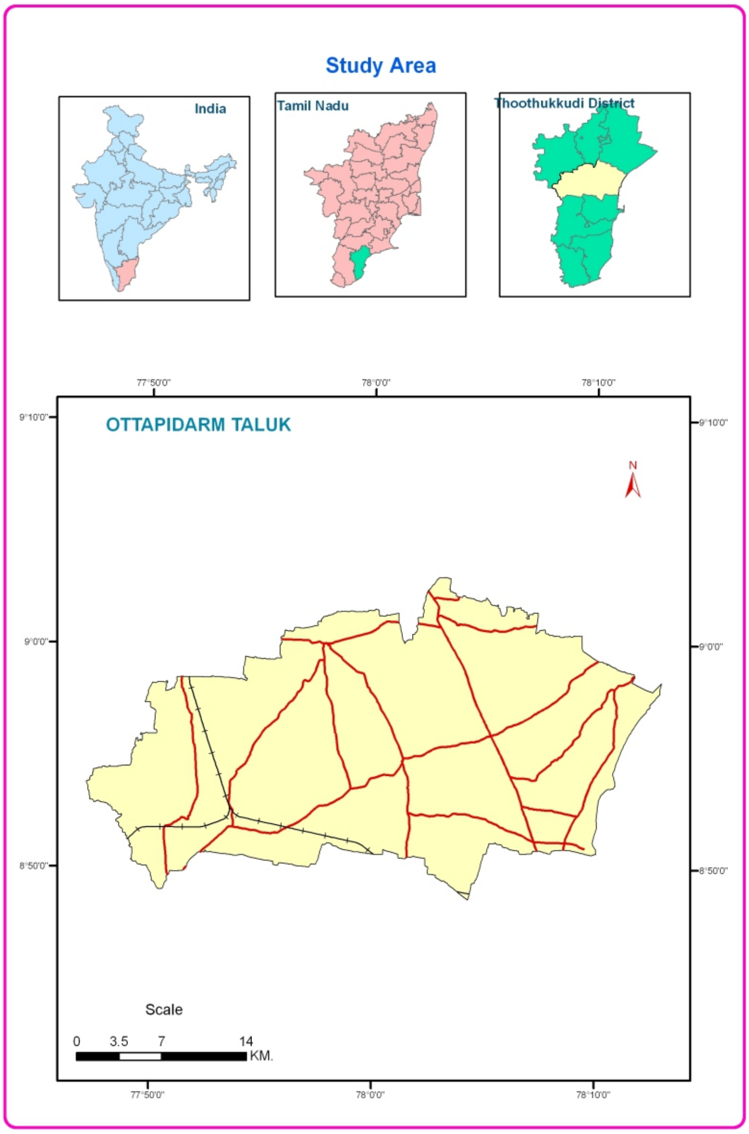

Fig. 1. Study Area and Rainfall Location Map

Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Rainfall in mm	412.50	478.10	595.50	611.00	857.10	667.50	984.30	586.20	761.00	620.00

Table 1. Annual rainfall data in mm of the overall Ottapidaram Taluk area (2002 - 2011)

Stations	Winter	Summer	Southwest Monsoon	Northeast Monsoon
Arasadi	18.32	82.89	51.82	279.03
Kadambur	20.85	173.74	137.30	497.86
Kayathar	24.77	170.82	114.44	529.56
Maniyachi	6.10	152.57	91.68	636.17
kIlIeral	20.23	168.99	142.67	519.65
Ottapidaram	21.37	97.41	77.31	372.31
Thoothukudi	60.77	132.53	83.20	512.65
Vedanatham	7.85	54.49	33.13	312.11
Average	22.53	129.18	91.44	457.42

Table 2. Average annual seasonal rainfall data of the study area in mm (2002 –2011)

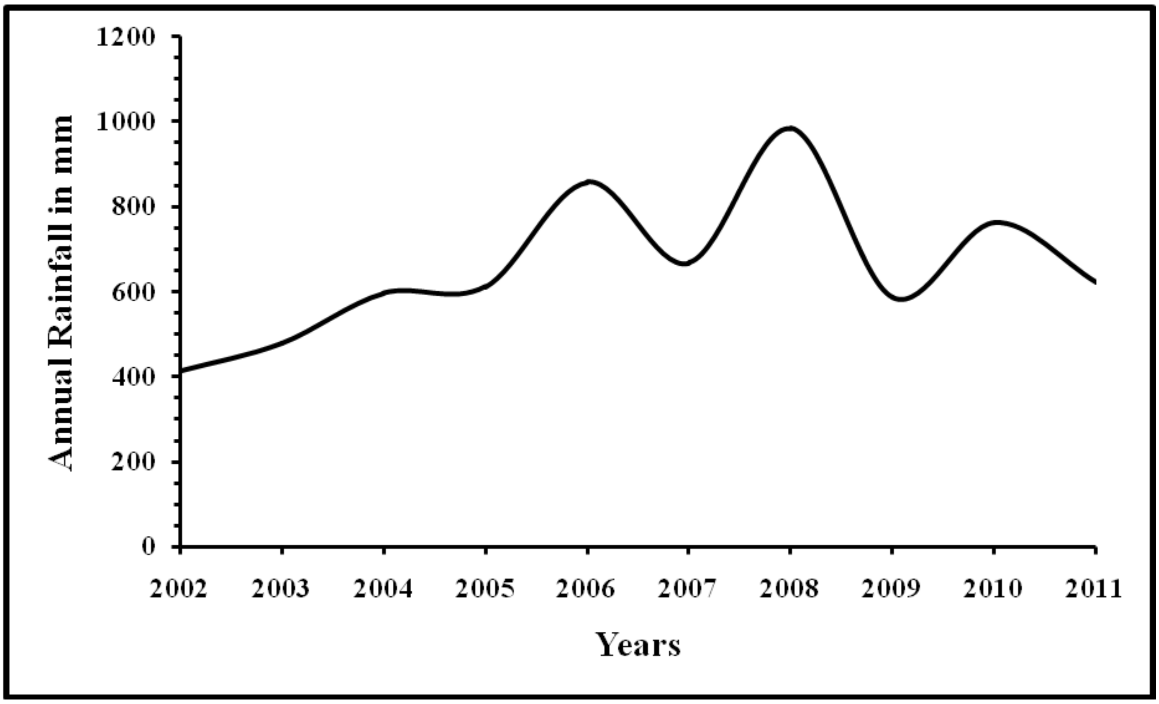

Fig 2. Fluctuation graph of rainfall data for the Period (2002 – 2011) in Ottapidaram Taluk

average annual rainfall for the last ten years was calculated. The ten years rainfall data (2002 to 2011) are calculated in ten rainfall stations at Arasadi, Kadambur, Kayathar, Maniyachi, Melaeral, Ottapidaram, Titucorin and Vedanatham in the study area. Based on the data, month wise and seasonal wise average rainfall was calculated. Finally using the above, the annual average rainfall was calculated and interpreted.

To find out the spatial distribution of the rainfall variation in the study area, GIS was employed. The rainfall location was digitized and the corresponding values (Average winter, summer, southwest, northeast and annual average rainfall) of its attributes were given as an input. Using this data, the interpolation raster maps were generated. Subsequently, these maps were classified with respect to our interest and converted into vector maps. These maps were clipped with the boundary to arrive within the boundary of the study area.

RESULT AND DISCUSSION

The eight raingauge stations studied only one station, Maniyachi showed a good response of rainfall and recharge relationship as they are directly related. Four stations namely Melaeral, Kadambur, Kayathar and Titucorin show a moderate dependence of recharge upon rainfall as the other three stations, namely Ottapidaram, Arasadi and Vedanatham show a poor dependence of direct recharge into the groundwater aquifer of the study area.

10 years (2002–2011) data were collected from statistical department and were interpreted result (Table 1 and Fig. 1). High rainfall noticed in 2008, lowest rainfall noticed in 2002. Table 2 and Fig. 2. Shows that, it is found that the average northeast monsoon rainfall is 457.42 mm and average summer season rainfall is 129.18 mm. In southwest monsoon and winter season, the average rainfall is noticed as 91.44 mm and 22.53 mm respectively. Average annual rain fall of 700.57 mm was observed for the years 2002-2011 rainfall interpretation.

GIS RESULTS

It is an analytical technique associated with the study of locations of geographic phenomena together with their spatial dimension and their associated attributes (like table analysis, classification, polygon classification and weight classification).

The winter, summer, southwest monsoon , northeast monsoon and annual average rainfall thematic maps as described above have been converted into raster form considering 30m as cell size to achieve considerable accuracy. These were then reclassified and assigned suitable weightage and spatial distribution results (Table 3).

The results of winter season, summer season, southwest monsoon season, north east monsoon and average annual rainfall for the period 2002-2011. GIS spatial distribution maps are shown in Fig. 4 to 8. It shows that, in the rainfall season wise spatial distribution maps results are given in Table 3.

The winter season GIS image reveals that high rainfall area noticed in south corner of the study area are have more than 22.53 mm rainfall recived (54.43 sq.km) were classified as high class (Fig. 4). Northeast and southwest corner of the study area have recived in low rainfall and moderate rainfall

Class	Winter Season Area in sq.km	Summer Season Area in sq. km	Southwest Season Area in sq.km	Northeast Season Area in sq.km	Annual Average Area in sq.km
Low Rainfall	211.65	76.31	173.42	52.29	75.57
Medium Rainfall	477.55	393.58	295.81	416.60	391.05
High Rainfall	54.43	273.74	274.39	274.73	277.00

Table 3. Result of Spatial Distribution - Rainfall in (2002 –2011)

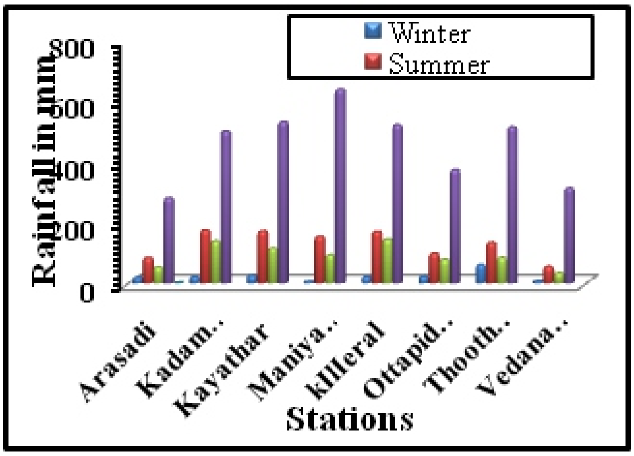

Fig.3. Season wise graph of rainfall for the period – 2002 to 2011

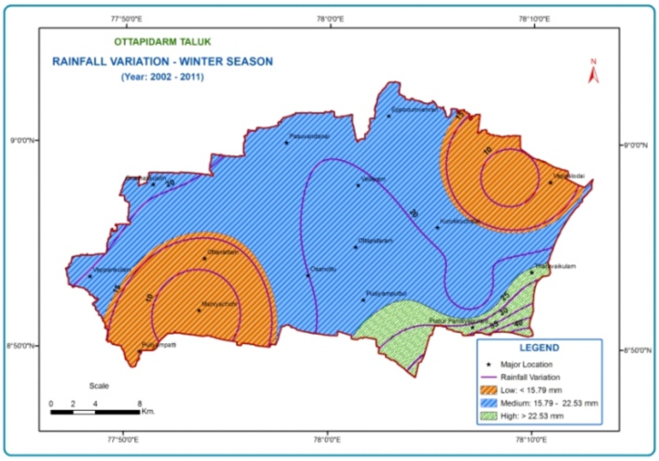

Fig.4. Annual average rainfall Winter Season – Spatial Distribution Map

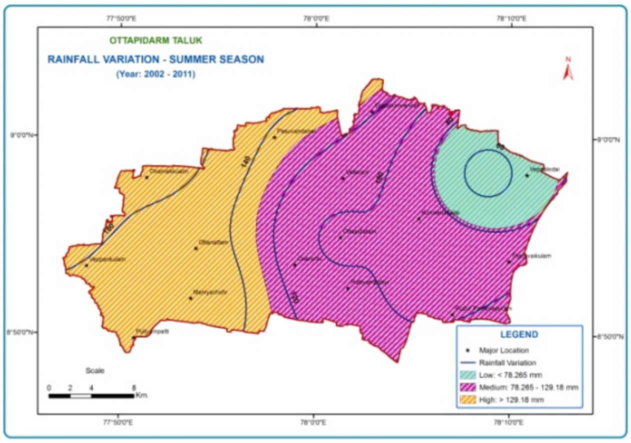

Fig.5. Annual average rainfall Summer Season – Spatial Distribution Map

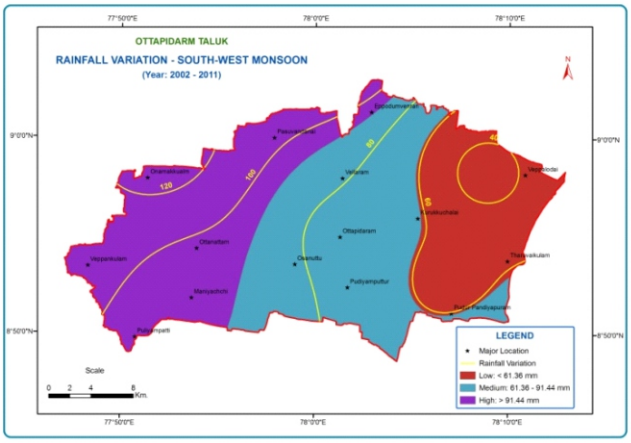

Fig.6. Annual average rainfall Southwest Monsoon Season – Spatial Distribution Map

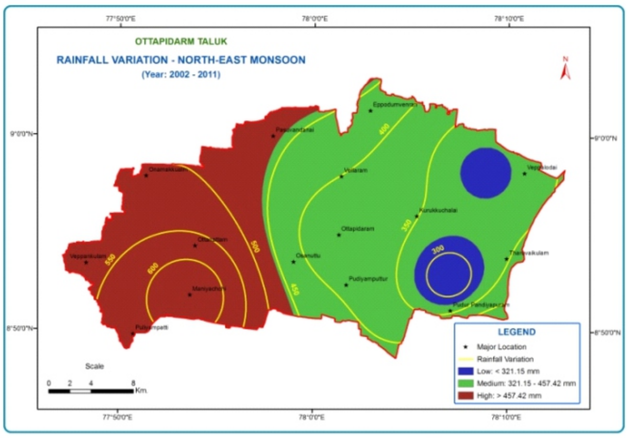

Fig.7. Annual average rainfall Northeast Monsoon

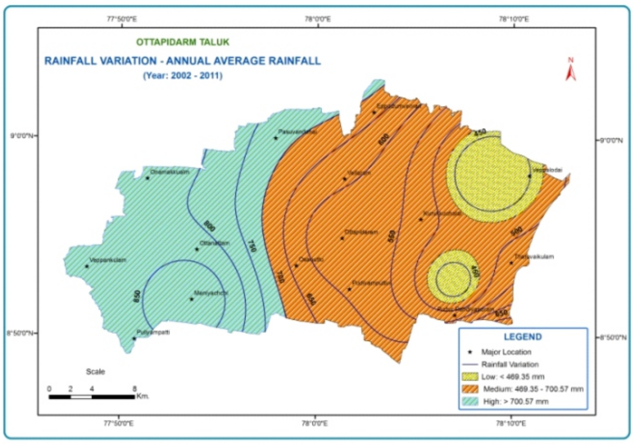

Fig.8. Annual average rainfall in 2002 to 2011 – Spatial

noticed in the middle of the study area. Most of the study area (477.55 sq.km) fall under medium rainfall catagory.

Summer season GIS image reveals that spatially 393.58 sq.km middle of the study area fell under in medium class and 273.74 sq.km northwest and southwest part of the study area falls in the high rainfall class (Fig. 5). The small portion of the study area fall under low rainfall are recived. The southwest monsoon GIS map (Fig. 6) reveals that from Shore line to land side gradually increased in high rainfall. spatially 274.39 sq.km area falls in the high rainfall class and 295.81 sq.km area falls in medium class.

Northeast monsoon GIS image reveals that spatially 274.73 sq.km areas falls in the high rainfall class, 52.29 sq.km area fell in low rainfall area and rest of the area 416.60 Km2 area falls in moderate class. Average annual rainfall spatial distribution result shows that spatially 277 sq.km areas fall in high rainfall category, 391.05 sq.km area fall in medium category and rest of the area 75.57 sq.km fall in low rainfall category.

CONCLUSION

The ten years rainfall (2002 to 2011) assessment of Ottapidaram taluk, Tuticorin District area reveals that sinusoidal fluctuation. The sinusoidal fluctuation observed study period and one year (2002) low rainfall noticed in all stations. The Maniyachi, Killeral, Kayathar and Kadambur station, showed a good response of rainfall and recharge relationship as they are directly related. The monsoonal and non monsoonal rainfall data in the study area were used to prepare the spatial distribution map. Non monsoonal period was very low rainfall in the study area (winter and summer season are low rainfall were compare in to the monsoonal seasons). Monsoonal period was high rainfall noticed in Maniyachi, Killeral, Kayathar and Kadambur surrounding areas (southwest monsoon season 295.81 sq.km areas in moderate category, 274.39 sq.km areas in good category (above 700 mm), northeast monsoon season 416.60 sq.km areas in moderate class and 274.73 areas in good category).

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