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MORPHOMETRIC ANALYSIS OF WATERSHED BY USING GEOSPATIAL TECHNOLOGY: A CASE STUDY OF PADI VILLAGE (SOUTH GOA)

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ABSTRACT

Geotechnological tools are being widely used in the different subjects throughout the world, geography is one of them. Application of GIS in drainage density has proved helpful in planning and arriving at projections. It is directly associated with the watershed management and landuse carried by human beings. Presently an attempt is made here to study the morphometric analysis in Padi village located in the Tehsil of Goa by using GIS in calculating the drainage densityandregression analysis in the area under study.

The study of stream order in drainage basin helps to identify the natural environment of place. The Geographers, Geoscientist, Hydrologist and Geologists study stream order in drainage basin to get idea of the size and strength of specific waterways within stream networks and important component to water management. Stream orders have been classified based on its relative position in the stream network, which helps us to understand the similarities and differences between them .Different types of stream order classification system has been developed , in that one of the earliest method and most commonly used method was developed by Strahler's in 1952.
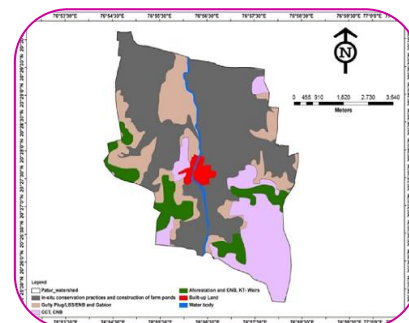
KEYWORDS : *Geotechnological tools , Geoscientist, Hydrologist and Geologists.*

INTRODUCTION

The word 'morphometric' has originated in the Greek word 'morphe', meaning shape or form and 'metria' meaning measurement. Morphometric refers to the quantitative analysis of form,a concept that encompasses size and shape.The statistical parameters defining drainage basin characteristics and basin hydrology are designated as morphometric analysis.Development of a drainage system and the flowing pattern of a river over space and time are influenced by several variables such as geology, geomorphology, structural components, soil, and vegetation of the area through which it flows. Various hydrological phenomena can be correlated withthe physiographic characteristics of an drainage basin suchas size, shape, slope of the drainage area, drainage density,size and length of the contributories, etc. (Rastogi and Sharma 1976; Magesh et al. 2012).In traditional methods, it is difficult to examine all drainage networks from filed observations due to their extent throughout rough terrain and or vast area. Drainage characteristics of many river basins and sub basins in different parts of the globe have been studied using conventional methods (Krishnamurthy et al., 1996).

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STUDY REGION:

Padivillage is located between 15^0 04' 43" N to 15^0 06' 20" N latitude and 74^0 01' 47" E to 74^0 04' 09" E longitude, with maximum height of 332 m. (Fig.1).The selected watershed area is 3.091 miles and watershed perimeter is 7.733 miles. Slope is from east to west direction.
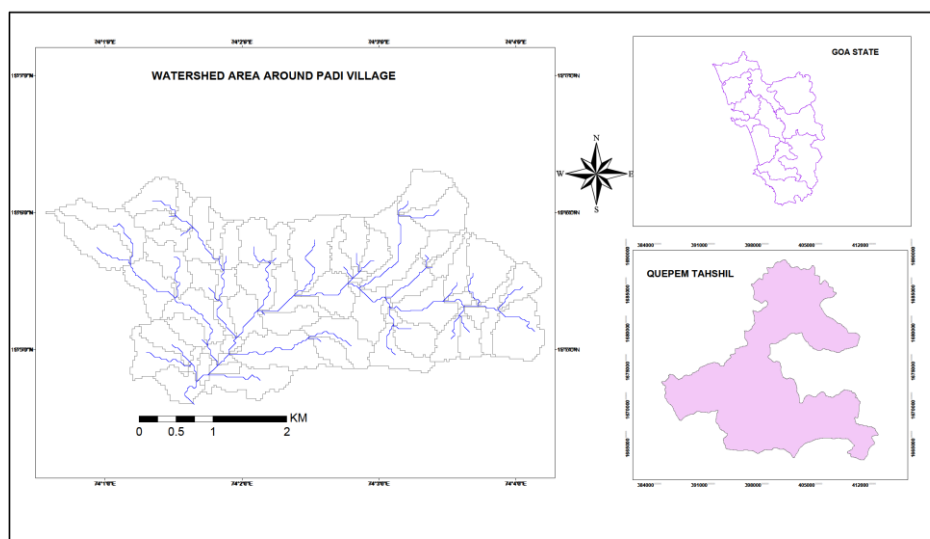
LOCATION MAP OF STUDY AREA

Fig. 1 Location map of study area

OBJECTIVES

1. Demarcate watershed area and drainage pattern around Padi village
2. Analyze morphometric characteristics with reference to relief and contour

DATA SOURCES

The present investigation is based on primary and secondary sources of data. The primary data is collected through Field Work with the help of GPS and keen observation of topographical features. For detail understanding of topography of study area Google Map and Toposheet 48 E/15 were also used. The secondary data is obtained from Bhuvan website, specifically ASTER DEM, Bhutan, February-2012 data is used for present investigation.

METHODOLOGY:

Figure2 shows the methodology used for this project. Stream ordering was done by using Horton's method of classification. Relationship between stream order and number of streams is shown with the help of regression equation. Cross profiles are also plotted shown based on DEM model.
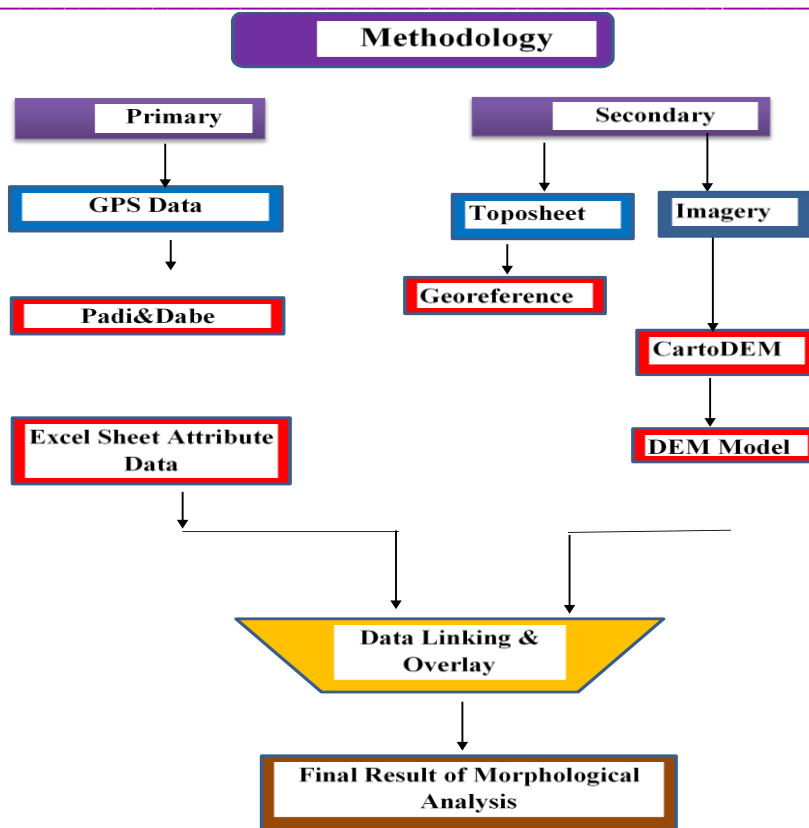
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Fig. 2

DISCUSSION:

Drainage density:

The drainage density of the catchments 1.5233 km is an influence of structurally controlled permeable rock strata with high vegetation cover. It increases high surface runoff, which cause erodability of rock, and loss of thin cover of topsoil. .It was inferred that the area is very coarser watershed. Watershed around Padi village has 39 streams of first order, 9 second order streams,3 third order streams and 1 stream of fourth order(Fig. 3). Regression values for the stream order and number of streams ranges between 34.91 for the first order to 1.07 for the last order.

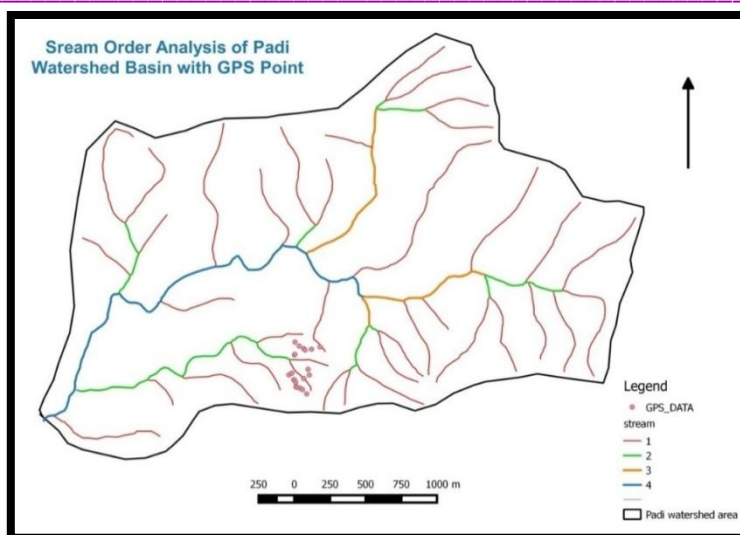**Fig. 3. Watershed Delineation**

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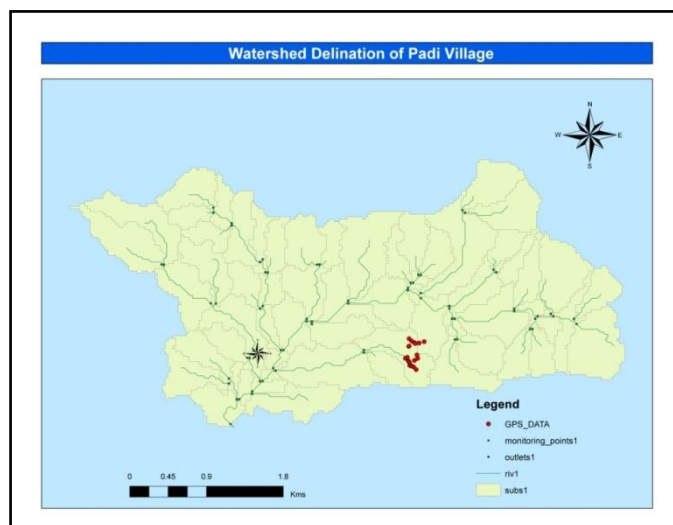
Fig. 4 Stream order Analysis

Stream Numbers: In the study area, the total streams segments present are 52 of which 75 % are first order streams having 39 segments .The second order stream segments are 09 and account for 17.31 %; Third order stream segments are 03 and accounted 5.77 % and Fourth order stream segments are 01 and account for 1.92% .

Stream Order(u)	1	2	3	4	Total
Number of Streams (Nu)	39	09	03	01	52
Percentages	75	17.31	5.77	1.92	100

Table: Stream order and Number of streams with percentage

Relief

Fig.5 shows the relief of the studied area. Closely spaced contours are visible in the north western, north eastern and south eastern part, indicating the presence of hills, a source of the first order streams. from here the streams are moving towards the southern direction and fourth order stream has originated here. Further detail characteristics of the area is seen by the profile drawn of the studied watershed.

Fig. 5Relief : contour of Padi

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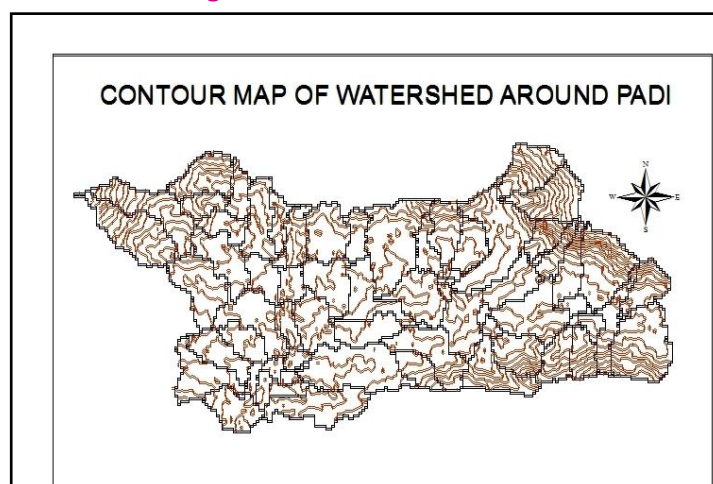
CONCLUSION:

From the foregoing analysis it can be concluded that the maximum height is 332 and minimum 60 m in the north east and west respectively. The watershed area has developed upto four stream orders. All these characteristics have showed impact on the landuse and landcover in the surrounding area.This has shown the occurrence of terraced cultivation, containing padi cultivation, coconut, arecanut and acasia plantations. Decidious forest is found in the vicinity of the watershed area. Shifting cultivation is also present in the vicinity of the forest area. Laterite soil dominates the entire track of the Padi watershed area.

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