Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(5): 2600-2604
Received: 25-07-2018
Accepted: 27-08-2018

V Sai Krishna
M. Tech student, Department of Food and Agricultural Process Engineering, Kelappaji College of Agricultural Engineering and Technology, Kerala Agricultural University, Kerala, India

S Jhansi Lakshmi
M. Tech student, Department of Processing and Food Engineering, College of Agricultural Engineering, University of Agricultural Sciences, Raichur, Karnataka, India

Dr. MV Ramana
Principal Scientist, RARS Tirupati, Andhra Pradesh, India

Correspondence
V Sai Krishna
M. Tech student, Department of Food and Agricultural Process Engineering, Kelappaji College of Agricultural Engineering and Technology, Kerala Agricultural University, Kerala, India

Estimation of soil and water conservation measures in micro-watershed

V Sai Krishna, S Jhansi Lakshmi and Dr. MV Ramana

Abstract
Soil is an important entity; hence the study is about soil conservation measures in micro-watershed. Present land use maps and Present land slope maps are generated using quantum geographical information system (QGIS) and Google earth domain. Global positioning system (GPS) was used for delineation of micro-watershed which consists 390.91 ha area. Parameters required for watershed characteristics were generated using remote sensing and ancillary data in QGIS mode. Based on slope classification and watershed characteristics; conservation practices, drainage line treatments and water harvesting structures were proposed. We also applied the watershed management principles to College of Agricultural Engineering, Madakasira by considering the college boundary as ridge boundaries and proposed engineering structures accordingly. Contour maps were generated using Surfer 8 software for Madakasira college campus. Madakasira campus was delineated and proposed land use map was prepared. Hence the Moto of this study is based on remote sensing tools for generation of land use maps for easy location of erosion points and their preventive conservation measure.

Keywords: Erosion, QGIS, GPS, delineation, contour map, google earth domain

Introduction
In India, out of the total geographical area of 329 Million hectare it is estimated that about 175 Million hectares of land is severely affected by erosion due to wind, water and shifting cultivation (Das, 1985). From 80 M hectares of cultivated land, a 6000 M tonne of soil is eroded every year losing 8.4 M tonnes of nutrients. Nearly 53% of country total land area is subjected to severe erosion (Singh *et al*., 1981) [6]. To tackle this problem effectively, measures are to be taken on watershed basis. A watershed is the area of land where Precipitated water drains off through a common outlet. The soil erosion problems can better rectified on the basis of watershed development (Valdiya, 1985; Rawat and Rawat, 1994) [7, 5].
In Madakasira, the College of Agricultural Engineering (CAE) Campus is located between 77°18'36.97"E to 77°18'44.39"E East longitude and 13°56'54.89"N to 13°57'11.20"N North latitude and elevation ranging from 640-644 m above mean sea level. The land is having the slope less than 2%. The major soil groups found are red and black soils and soils can be classified as sandy loams (31%), clay (24%) loamy sands (14%), sandy clay loams (13%) and rocky lands (12%) in texture. The fertility status is that the Soils are poor in organic carbon content and about 88% soils analyzed in the district are low in Nitrogen, about 75% soils are medium to high in Phosphorus content and 94% soils are medium to high in Potassium content. The total area surveyed is 12.63 hectares. The land use pattern in the watershed comprises of agriculture and fallow land where Ground nut is the major cultivated crop, irrigation is based on rain fed, sprinklers, drippers and surface irrigation. The stream order comprises of 1st order stream. With the above background, watershed planning has been done to conserve the soil and for better management of water resources in the region. statistical approach to optimize the extraction conditions. The analytical method showed high extraction yields for the determination of this compound in a complex matrix such as tissue. Moreover, the extraction procedure was very fast and it matrix solid phase dispersion (MSPD) extraction method followed by analysis with a LC tandem mass spectrometry system and applied the multivariate statistical approach to optimize the extraction conditions. The analytical method showed high extraction yields for the determination of this compound in

Materials and Methods
Reconnaissance survey was conducted to gather initial information regarding the presence or absence of historic properties at CAE campus Watershed, Madakasira. The results of a reconnaissance survey include field visit, preparation of rough map of the field area, pace marking the different resources and useful remarks in the map.

A global positioning system (GPS) is a computer based information system that enables capture, modeling, manipulation, retrieval, analysis and presentation of geographically referenced data (Ogden *et al.*, 2000). GPS was used to plot the boundaries of the watershed on the map using latitude, longitude and altitude values of the watershed boundaries. It was used to plot different land uses like agricultural fields, forests, streams, grass lands, tea plantation crops, etc.

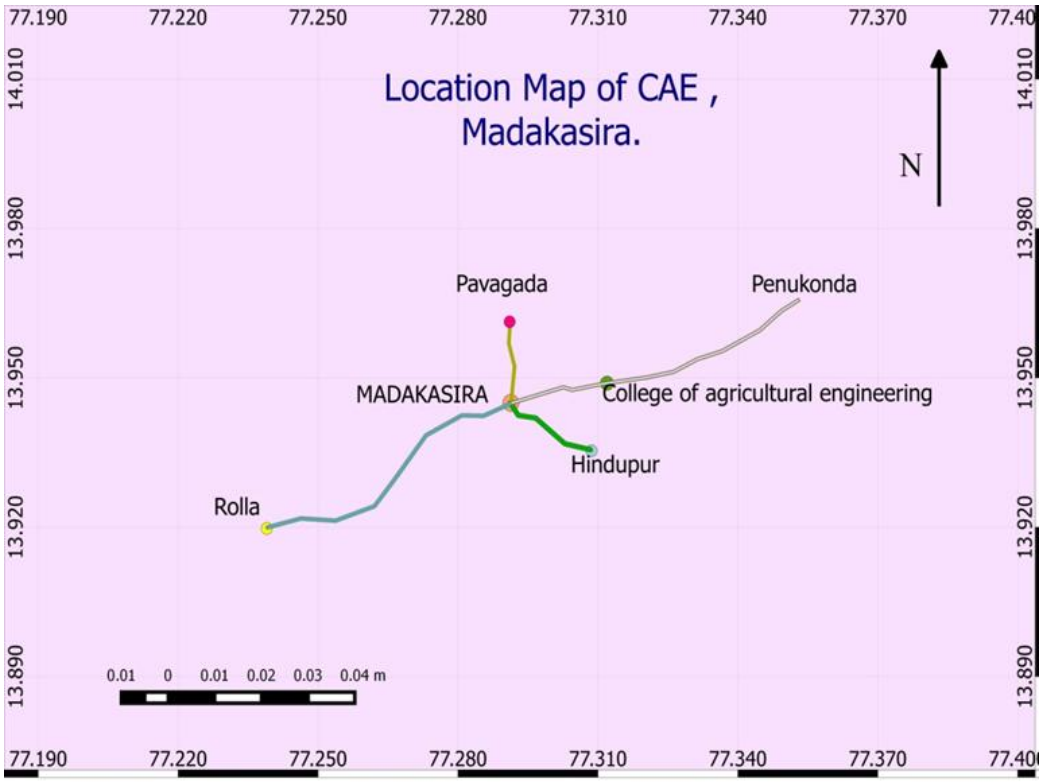

Fig 1: Location map of CAE campus

With the development of computer and information technology, distributed hydrologic models become research focus, in which Google Earth is free domain which is used for delineating the watershed. It is to be noted that high resolution data is available which can be used for demarking different land uses. It is a vital input for watershed planning, as even small individual fields can be demarcated clearly after importing in Quantum geographic information system (QGIS) software (Morgan *et al.*, 1984) [2].

A QGIS is a type of information system that deals specifically with geographic, or spatial, information. Like other information systems, a QGIS requires lots of data that it can access, manipulate, and use to produce a With the development of computer and information technology, distributed hydrologic models become research focus, in which Google Earth is free domain which is used for delineating the watershed. It is to be noted that high resolution data is available which can be used for demarking different land uses. It is a vital input for watershed planning, as even small individual fields can be demarcated clearly after importing in Quantum geographic information system (QGIS) software (Morgan *et al.*, 1984) [2].

A QGIS is a type of information system that deals specifically with geographic, or spatial, information. Like other information systems, a QGIS requires lots of data that it can access, manipulate, and use to produce a product. The shape files which are saved in the computer system are imported into the QGIS software in the form of layers. The present land use map of CAE campus was generated using QGIS which includes different land uses like agricultural fields, play grounds, streams, roads and buildings.

An Abneys level is a device used to find the slope in the watershed for all the land uses. The slope of CAE college campus was <2%. To measure the slope of the ground, the observer stands at one end of the slope and directs the instrument on the mark or vane fixed on the ranging rod at the same height as the observer eye, held at the other end, and turns the milled wheel until the reflected image of the bubble is brought to the centre of its run and intersected by the cross wire. Now substitute the value (α) in $\tan^{-1}(\alpha)$, which gives the slope of the land. Slope map is used for preparing the proposed land use map. Land slope map is very essential for preparing the proposed land use map. The classification of slope increased from main stream to the ridge boundary of the watershed, the slope was less near the main stream.

Drainage line treatment requires longitudional section and cross-section of the streams which were taken using dumpy level and staff for estimating the design for the check dams, it is also used in stream widening in gully control. The elevation are taken for 2 streams, the selected length for measuring longitudinal section is 100m (length).the table shows the elevations along the stream at an interval of 5m.

Considering present engineering structures map, adverse erosion points were located using GPS and specified recommended engineering structures, Map of proposed engineering structure were prepared using present existing structures map. The contour map of CAE college campus was generated using surfer software, grid points were recorded and map was created. The survey conducted in CAE Campus, results no engineering structures in the watershed. Hence it was necessary to propose engineering structure in order to preserve water and soil loss from the watershed.

Results and discussion

Watershed characteristics

Watershed parameters corresponding to the study area were evaluated using QGIS 2.4. CAE campus watershed was delineated based on the contour map prepared in GIS environment. Preparation of present land use map, slope map and proposed engineering structure map was carried out in GIS environment.

Table 1: Watershed Characteristics of Madakasira College campus

Characteristics	Results
Shape index	1.78
Length of main stream	470 m
Drainage density	0.0073185 m/m^2
Average slope	0.621 %
Watershed relief	4 m
Time of concentration	10.536 min
Perimeter	1478.53 m
Form factor	0.9923
Compactness coefficient	1.186
Elongation ratio	0.85

Drainage line treatment

The check dam was proposed based on longitudinal section map, the point where there is sudden elevation drop is more evident for erosion, and hence it is recommended to proposed check dam (Murthy, 2000) [3].

For designing the check dam cross- section of the stream is essential. Check dam was proposed at 80 m chainage due to sudden elevation drop and corresponding cross-section is measured.

Longitudinal Section and Cross-Section

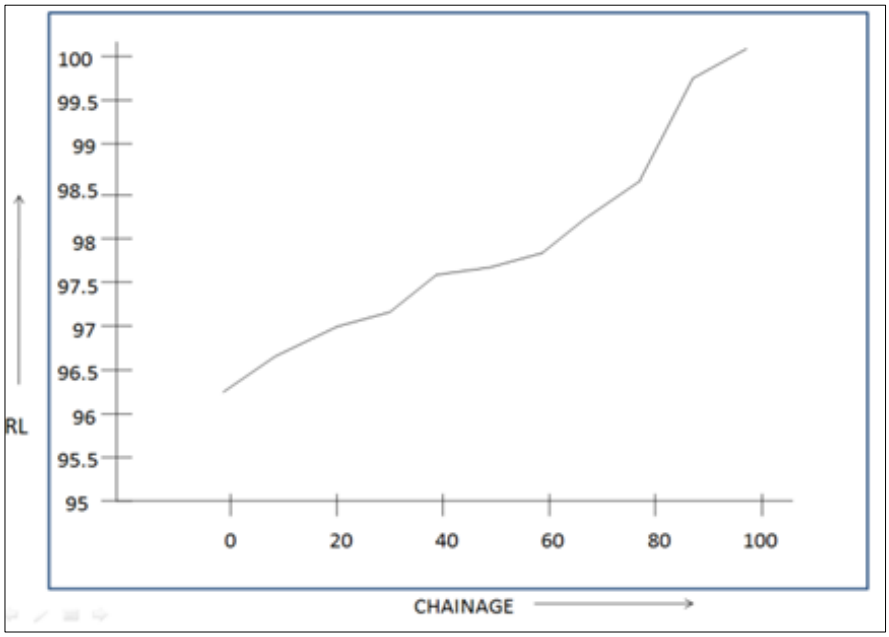

Fig 2: Longitudinal section

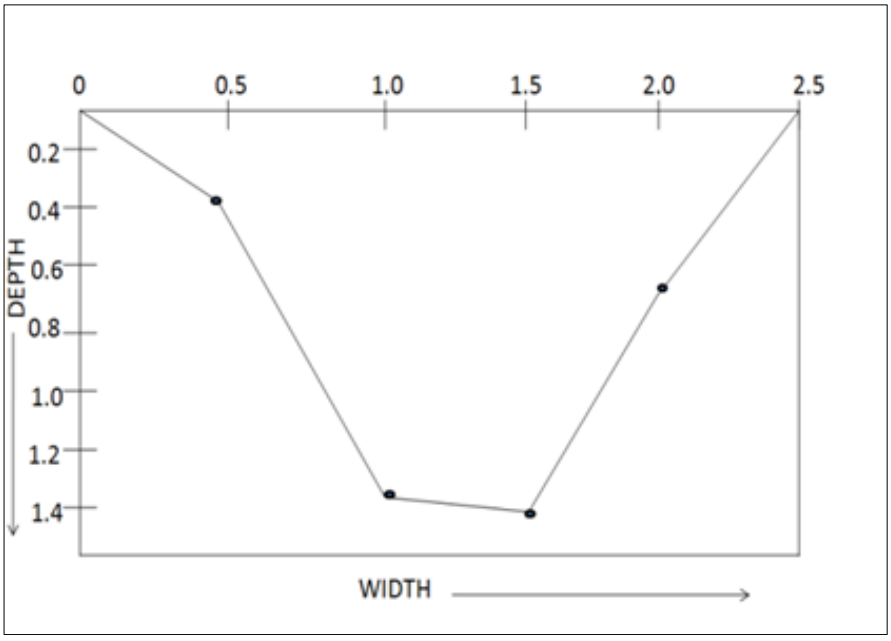

Fig 3: Cross-Section

Table 2: Present land use pattern of Madakasira college campus

S. No.	Engineering Structures	Area (ha)
1	College	0.7028
2	Men's hostel	0.0436
3	Ladies hostel	0.0445
4	Cricket ground	1.7566
5	Badminton court	0.0536
6	Volley ball court	0.0235
7	Polytechnic college	0.1048
8	College shed	0.0125
9	Tar road	0.1032
10	Temple	0.0057
11	Weather station	0.0034
12	Agriculture field	4.9784
13	Garage Building	0.0091
14	Garden	0.0123
15	Barren land	8.7470

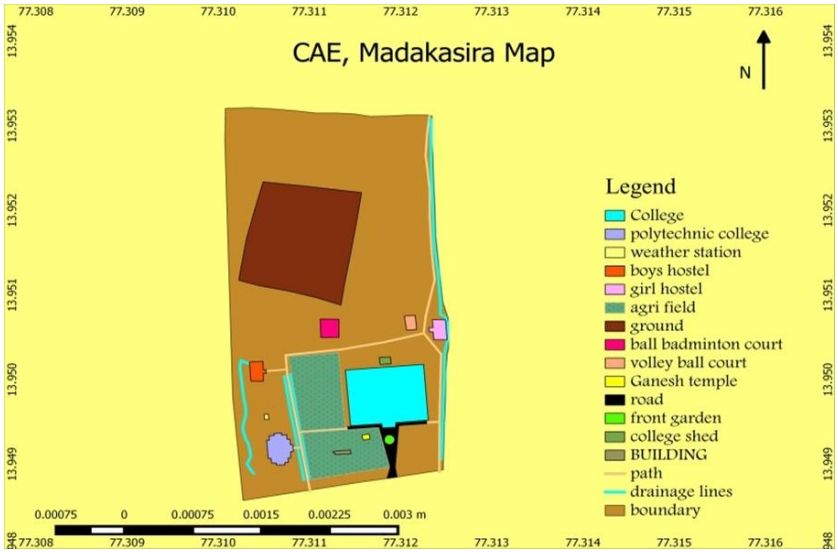

Fig 4: Present land use

Contour Map of CAE Campus, Madakasira

The contour map was prepared using Surfer 8.0 and shown in Fig. 5 and Fig. 6. The maximum and minimum elevations in the study area from the contour map were found to be 644 m and 640 m respectively. Hence the watershed relief is 4 m. From the contour map it was observed that the land was flat land. The study area boundary with proposed engineering structures has been delineated in QGIS environment as presented in Figure 7. The total area under the study is 12.63 ha. The perimeter of the study area boundary has been found to be 1478.53 m.

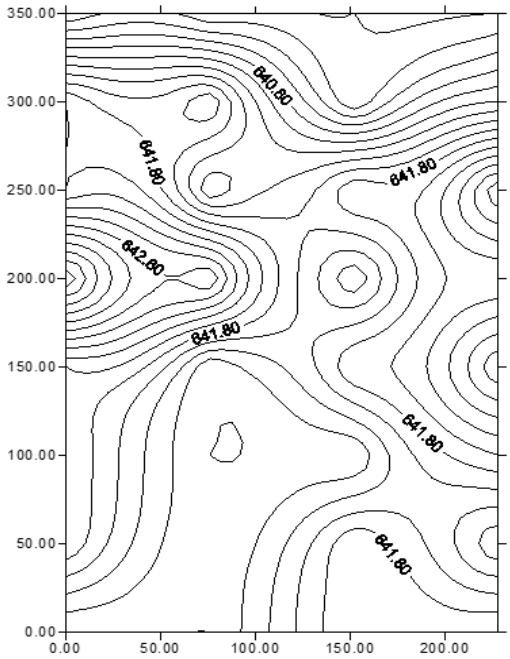

Fig 5: Contour map (2D)

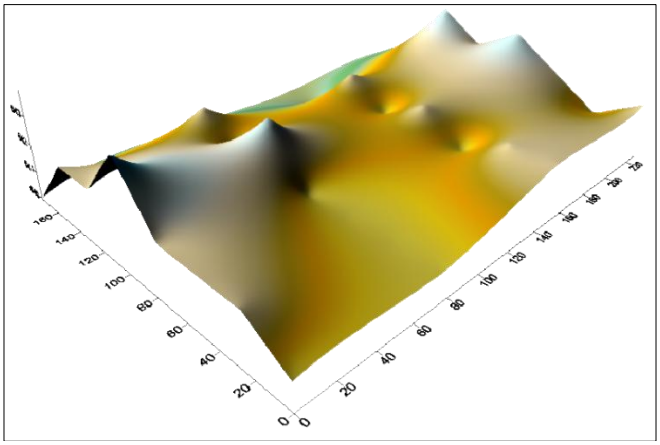

Fig 6: Contour map (3D)

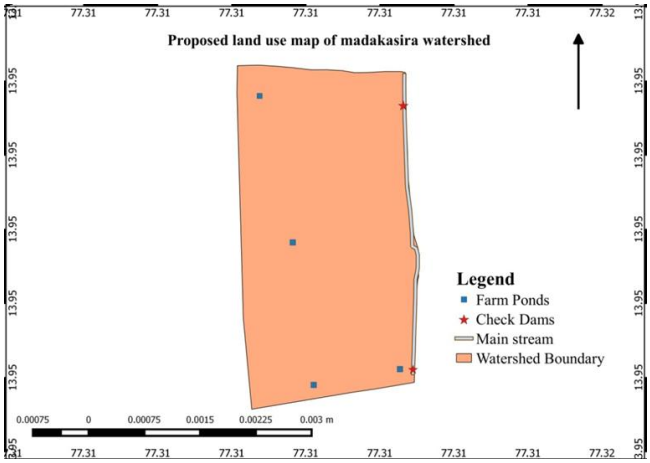

Fig 7: Proposed Engineering Structures

Conclusion

Digital mapping saves time and improves quality of the generated map without errors. GPS device was useful for easy location of points within the watershed. All recommendations were made based on watershed characteristics and present land use pattern as well as slope map of the watershed. With the help of proposed maps, it was easy to propose and locate the conservation measures and engineering structures in the study area for preventing erosion losses.

Compliance with Ethical Standards

No funding and during research there is no involvement of human participants and animals.

Conflict of Interest

No conflict of interest

Funding

No funding

References

1. Das DC. Soil Conservation Practices and Erosion Control in India - A Case Study, FAO Soils Bulletin. 1977; 33:11-50.
2. Morgan RPC, Morgan DDV, Finney HJ. A predictive model for the assessment for the soil erosion risk, J Agriculture Engineering Research. 1984; 30:245-253.
3. Murthy JVS. A Text book of Watershed management in India, Wiley Eastern Limited, 2000
4. Ogden FL, Garbrecht J, De Barry PA, Johnson LE. GIS and distributed watershed models-II: Modules, Interfaces and Models. J Hydrologic Engineering, ACSE. 2001; 6(6):515-523.
5. Rawat JS, Rawat MS. Accelerated erosion and denudation in the Nana Kosi watershed, Central Himalya, India, Part I: Sediment load, J Mountain Research and Development. 1994; 14(1)25-38.
6. Singh G, Chandra S, Babu R. Soil loss and prediction research in India, Central Soil and Water Conservation Research Training Institute, Bulletin No. T-12/D9, 1981.
7. Valdiya KS. Accelerated erosion and landslide-prone zones in the central Himalaya, Concepts and Strategies, Gyanodaya Prakashan, Nainital, 1985, 122-38.