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Agroedaphic zoning of undulating topography using GIS techniques

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ABSTRACT
Planning of sustainable use of natural resources in highly undulating topography is quiet complex when compared to other area. Hence, the study was conducted to generate a soil resource database for generation of agroedaphic zones of Pathanamthitta district. Survey of India toposheets and soil resource maps from Department of Soil Survey were used for study purpose. The major soil-physiography observed in the study area is Low Land, Mid Land and High Land Of which 60 % of the area fall in midland region. 10 soil mapping units is observed in the study area. The study area is divided into 4 different slope gradient classes for Agro-Edaphic Zoning. They are very gently sloping (0-3%), gently sloping (3-5%), moderately sloping (5-10%), and steep sloping (>25%). The majority of the study area belongs to very gently sloping (0-3%). Agro-Edaphic data base were integrated in the GIS environment to obtain 11 Agro-Edaphic Zones

Key words : Topography, Agroedaphic zones, GIS technique.

INTRODUCTION

Sustainable development of regions with highly undulating topography is a challenging task as the areas are having highly diverse and fragile ecosystems. This makes the planning of the use of natural resources more complex than any other area. A practical approach is to subdivide the area of interest into smaller zones with homogenous soil units which may be of more or less similar soil characteristics (physiography soil texture, and soil depth) and slope. Several approaches of agro edaphic zones are in the country use manual integration for use of natural resource data (Sehgal, J.L *et. al.* 1992). Hence ,the present study aims at generating a soil resource database for development of agro edaphic zones in Pathanamthitta district.

MATERIALS AND METHODS

General Description of Study Area

Geographical Setting:

The study area for Agro-adaphic zoning is Pathanamthitta district which is a part Western Ghat ecosystem. The study area is situated between 76^0 29' to 77^0 01' E longitude and 9^0 06' N to 9^0 30' N latitude. The total area of the district is 2642 sq. km., of this 1390.73 sq.km., come under forest. The study area extends to nearly 124498 Ha.

Topography

The district consists of three natural divisions, viz., the lowland, the midland and the highland. The highland stretches through the western ghats and descends to the midland in the centre, down to the lowland and coconut gardens on the western borders of Alappuzha district. The topography of the district is highly undulating. It starts from the tall hillslopes covered with thick forests on the East along the mountains down to the valleys and small hills to the flat and of coconut trees in the West.

Data used:

Soil resource : Soil map along with its characteristics made available from Department of Soil Survey.
Collatoral : SOI Toposheets

Image processing & GIS Software used

ERDAS 8.6, Arc GIS

The various procedures adopted in the present investigation consists of following important steps.

Creation of Physiographic-soil data base

The soil resource inventory was compiled from reports of Department of Soil Survey, Kerala.

Creation of Terrain Slope data base

The terrain slope map of study area was created using Digital Elevation Model (DEM) generated from the SOI toposheets

Agro- edaphic zones (AEdZ)

Agro-edhapic zones depicting soil and terrain potentiality for agriculture was generated by combining soil characteristics (physiography soil texture, and soil depth), and slope.

The soil resources data base was derived from the soil maps. Agro-edaphic zones were generated by GIS aided integration of physiography, soil characteristics and terrain slope.

Key (Mapping Unit)

Agro-Edaphic Zone

a) Physiography

1 Low land 2 Mid Land 3 High Land

b) Soils

Table 1: Soil series of Pathanamthitta district

Legend	Series Name	Description
MTR	Muthur series	Muthur series- Wetland soils. Poorly drained alluvial soils with depth more than 150cm developed from fluvial sediments. Extremely acid. Soils dark brown to reddish yellow with clay loam to clay texture
VGL	Vengal series	Vengal series- Colluvio-alluvial soils. Moderately well drained soils with more than 100cm depth. Very strongly acid. Soils dark brown to yellowish brown with sandy clay loam to clay texture. Gravels noticed in the surface horizons.
AYR	Ayroor series	Ayroor series- Riverine alluvium. Imperfectly drained with depth more than 150cm developed from fluvial sediments on river banks. Medium acid. Soils dark reddish brown to yellowish red with loam to clay loam texture.
KVR	Kaviyoor series	Kaviyoor series- Laterite soils. Well drained soils with depth more than 100cm.

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