Rainfall-Runoff Estimation and Comparative Analysis Using SCS method based on GIS

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Overview

- Introduction
- Study Area
- Methodology to estimate runoff by SCS-CN model
- Hydrology Model in GIS
- Result & Discussion
- Conclusion & Recommendations

Introduction

- Watersheds are an ideal unit for planning and management of land and water resources.

- Accurate estimation of runoff and sediment yield amount is very an important task in physiographic for proper watershed management.

- Watershed management programs are mainly for conservation and development of natural resources. Where Most of the watersheds in Libya are ungauged.

- Of the many methods available for estimating runoff from rainfall, the curve number method (SCS-CN) is the most popular, the curve number depends upon soil and land use characteristics.
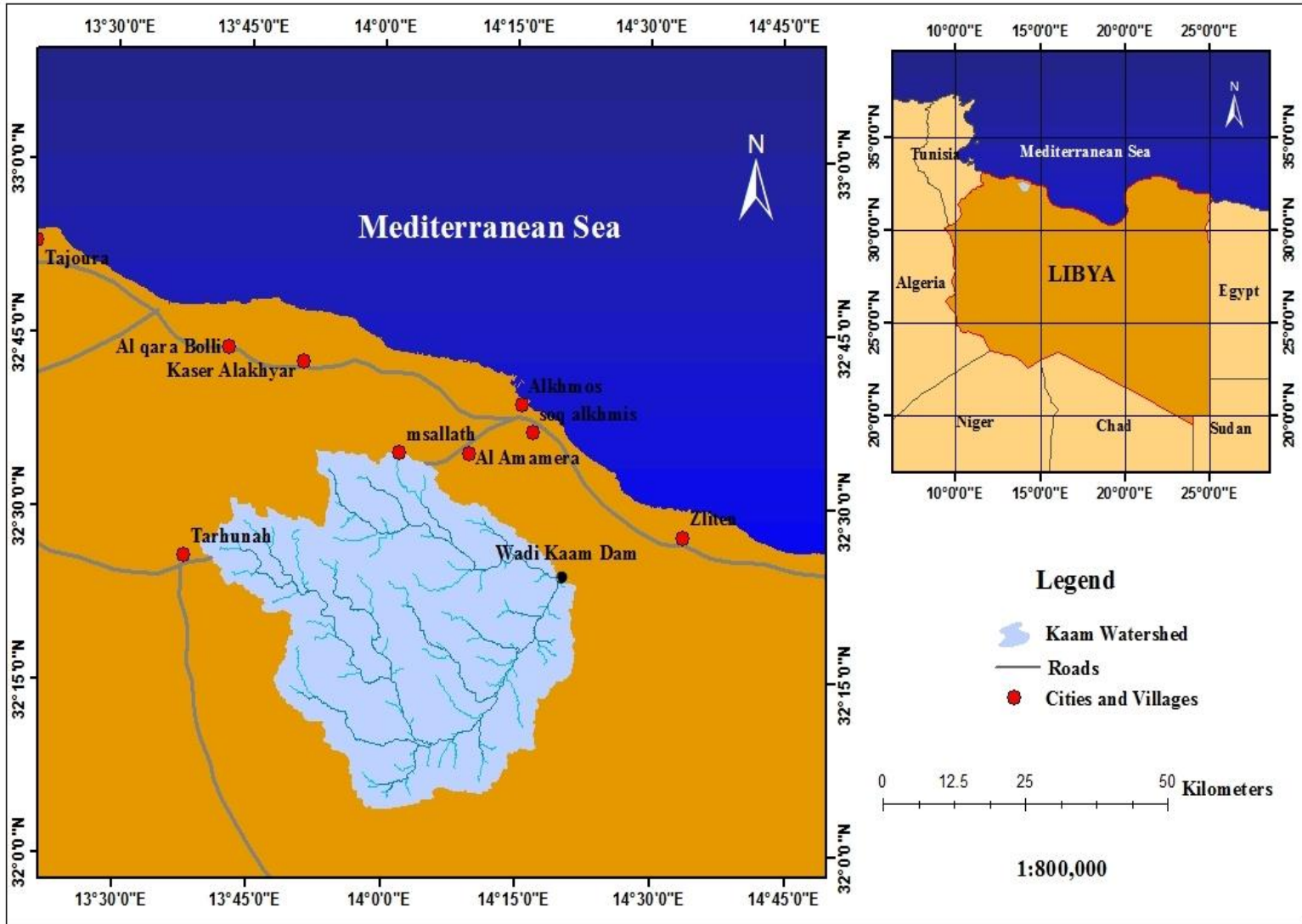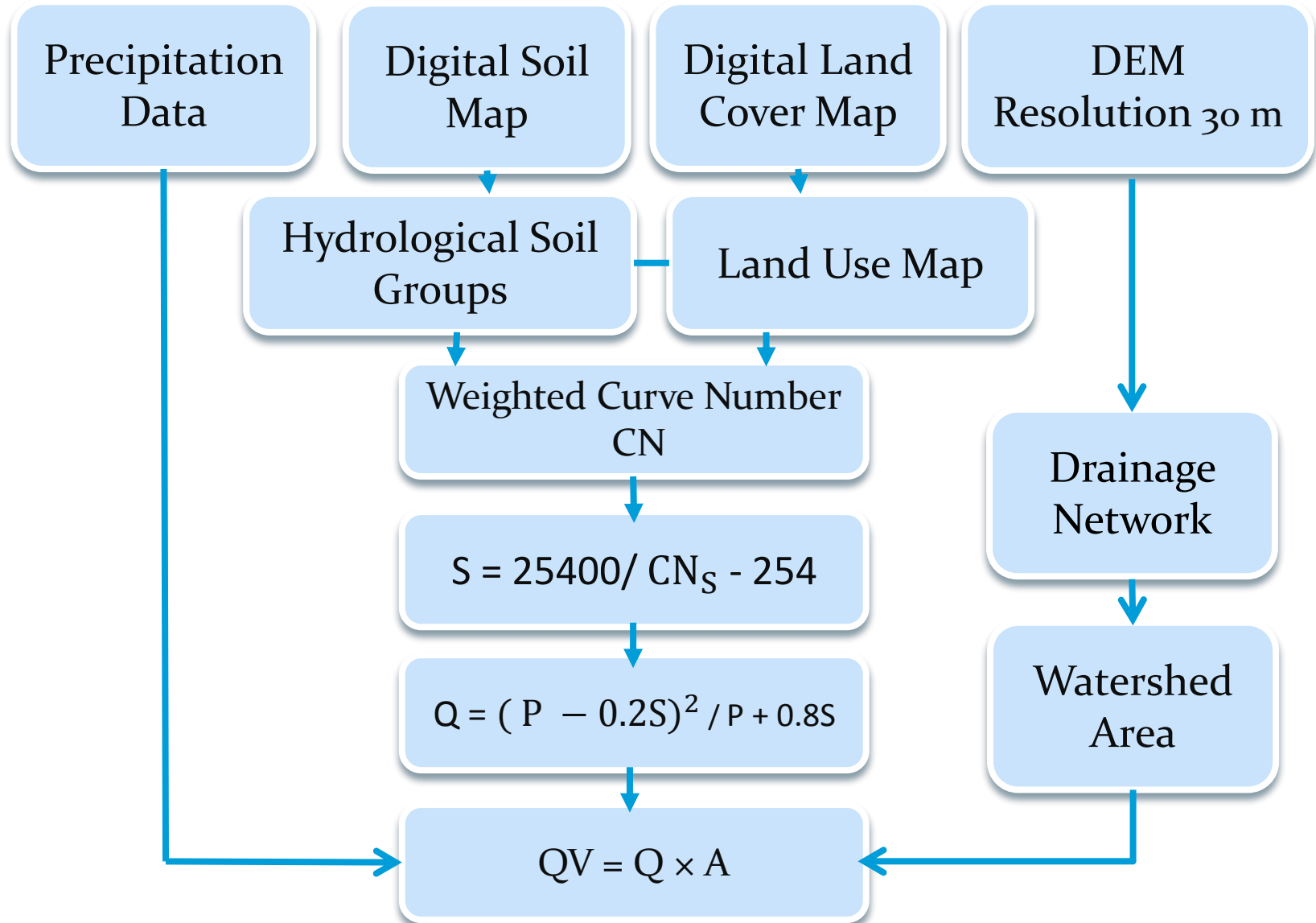
Study Area

Fig 1: The location of the study area

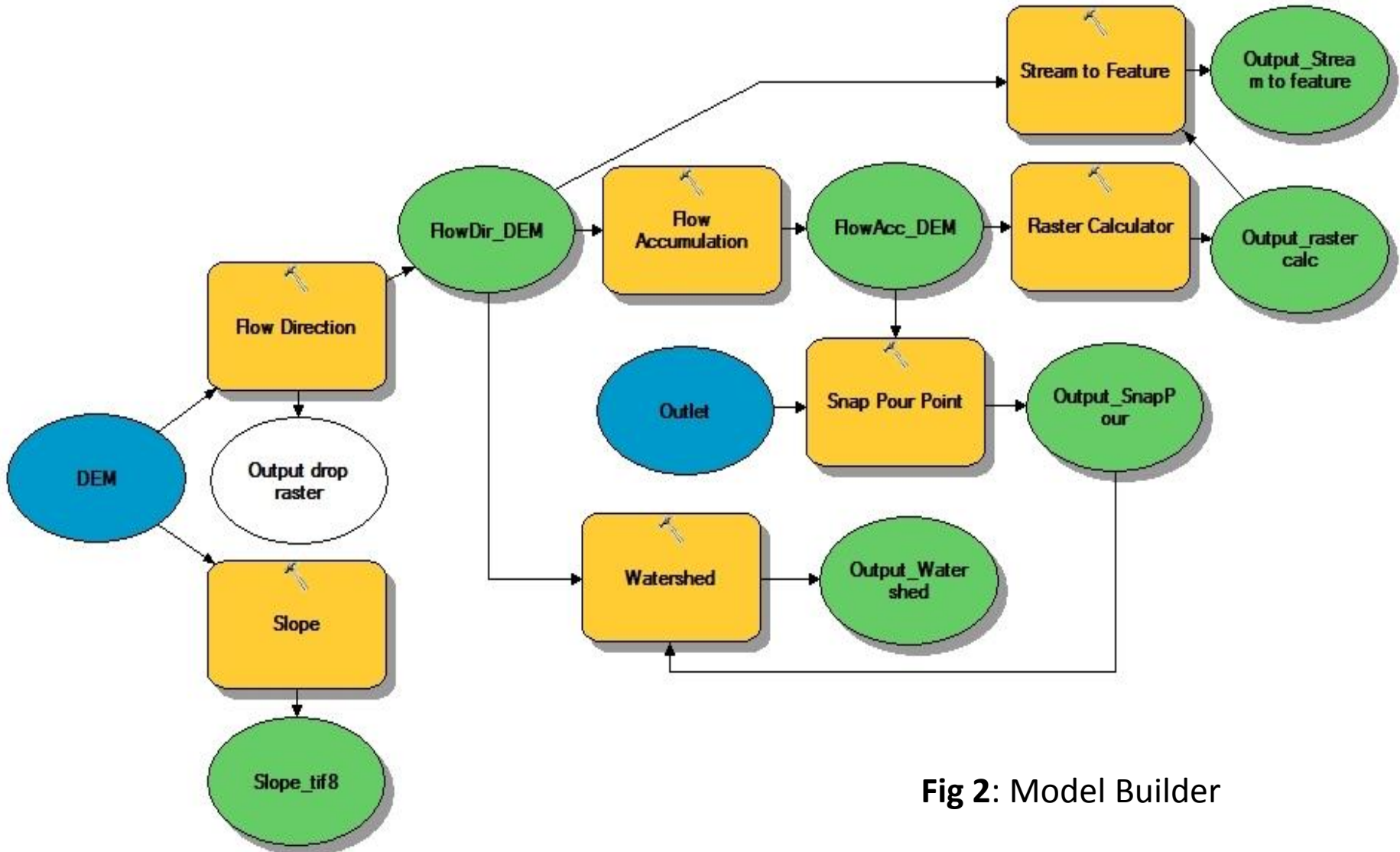# Methodology to estimate runoff by SCSCN model

Hydrology Model in GIS
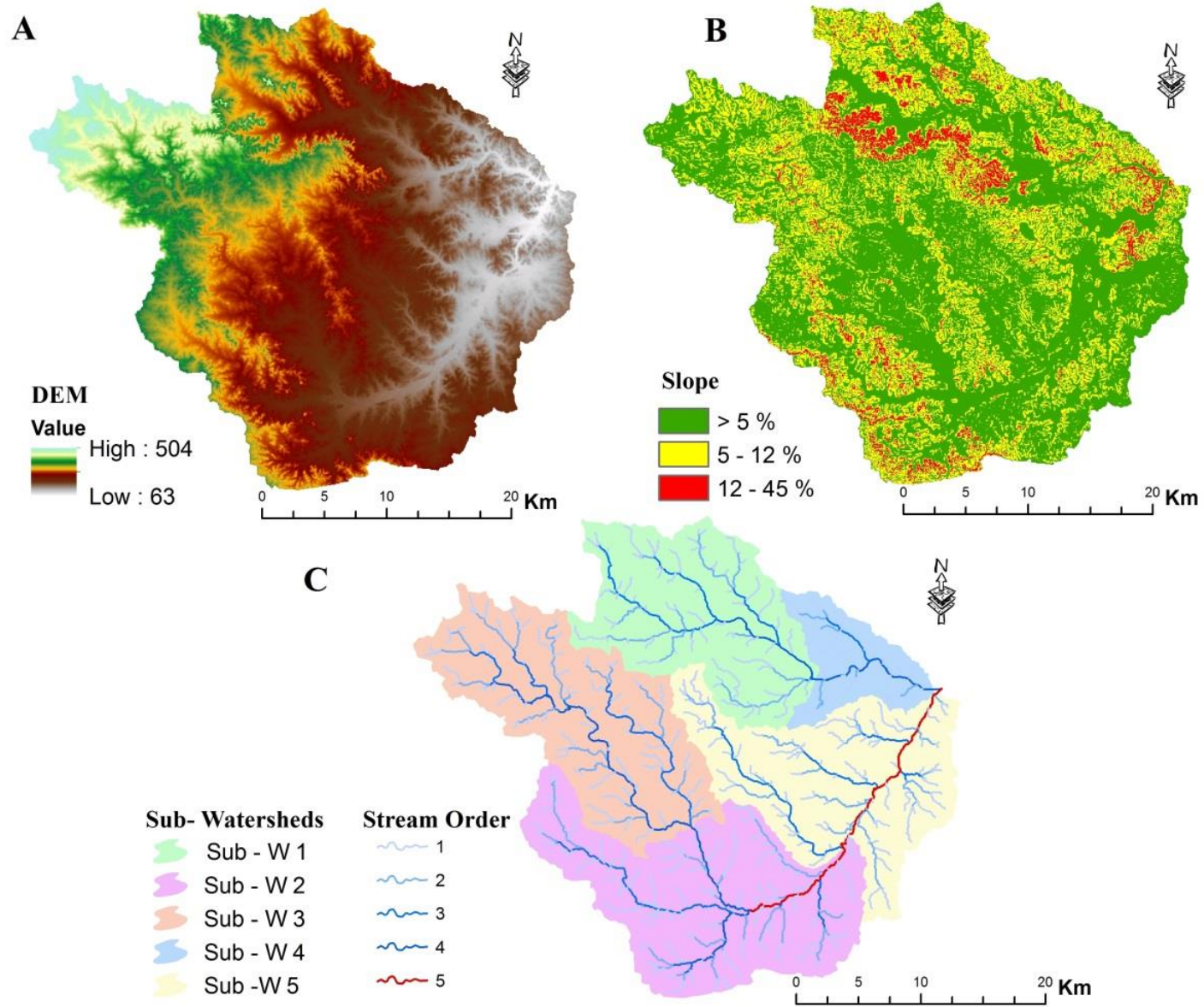

Fig 2: Model Builder

Result and Discussion
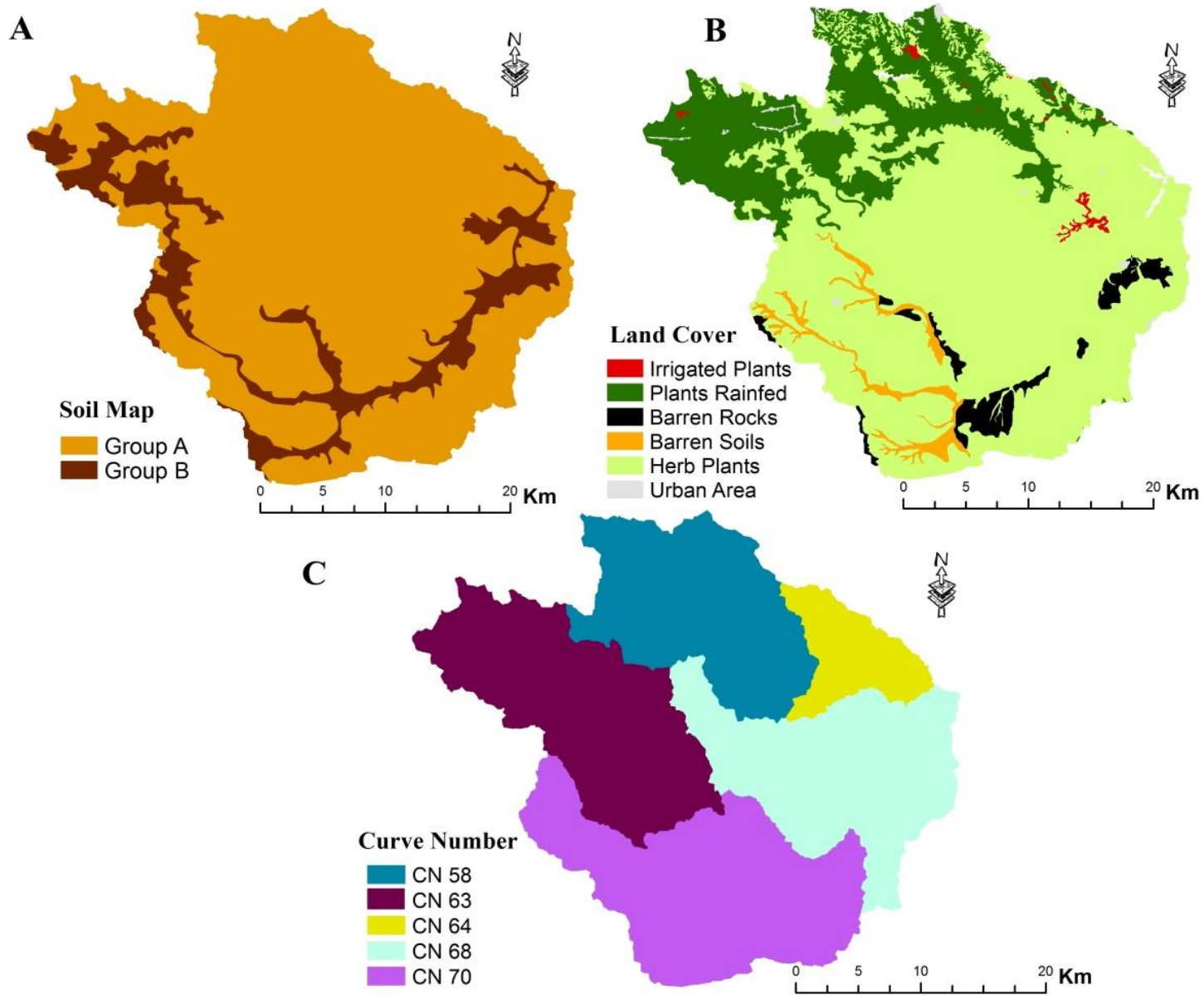

Fig 3: A (DEM Map) **B** (Slope Map) **C** (Sub-Watershed Map)

Fig 4: A (Hydrological Soil Group) **B** (Land use/Land cover Map) **C** (CN Map)

Table1: Hydrological soil groups

Texture	HSG
Sandy , loamy , sandy loam	A
Silt loam or loam	B
Sand clay loam	C
Clay loam , silt clay loam, sandy clay , silt clay, or clay	D

Source : (USDA , SCS 1975 , 1986) TR55

Table 2: Calculation of Weighted Curve Number for AMC II

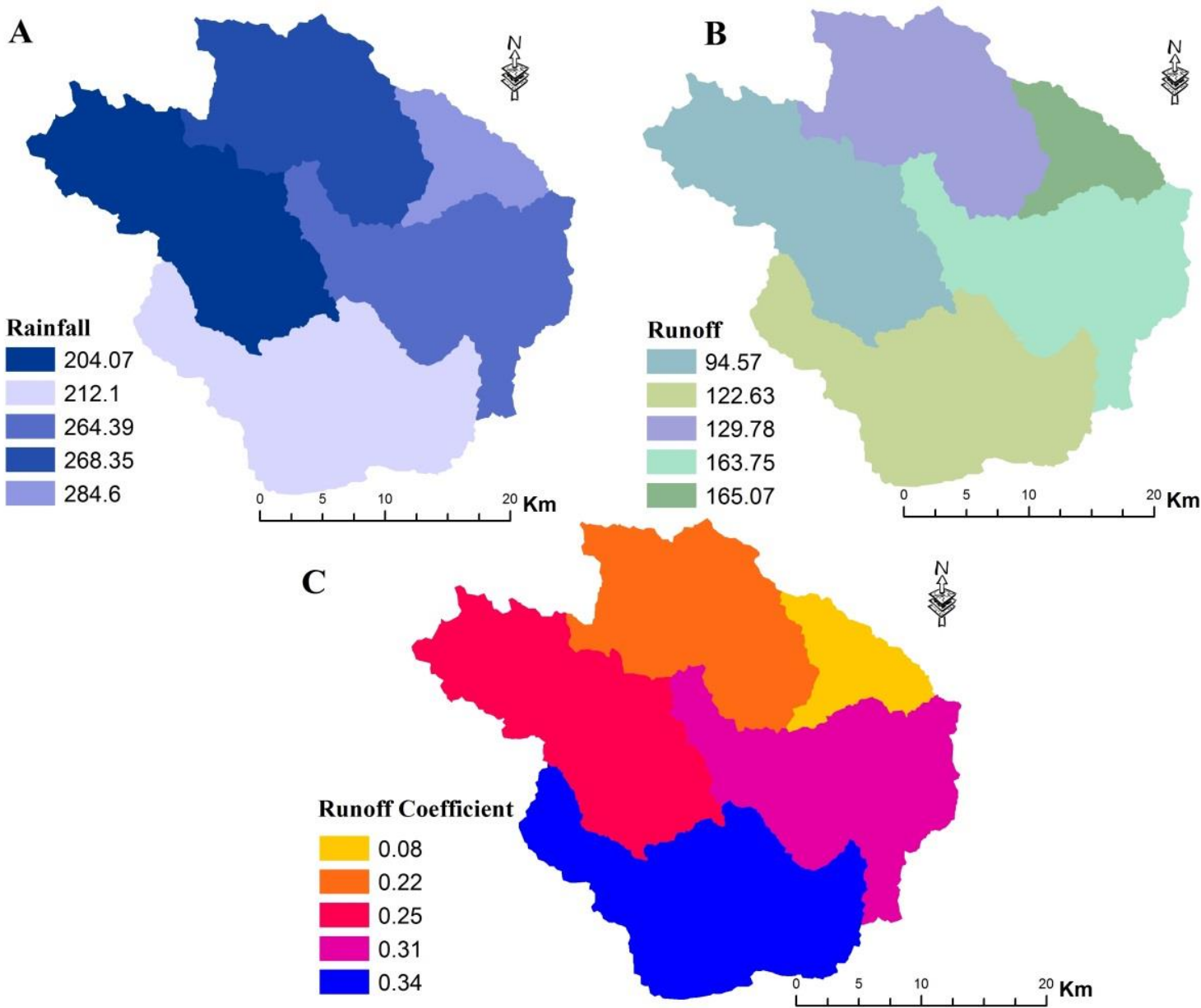| Area%	Area/Km^2	CN	HSG	Land Use
٠,٣٣	٧,٧١	67	A	Irrigated Plants
0.15	٣,٥١	78	B	
١٨,٣٥	٤١٩	49	A	Plants Rain fed
3.88	٨٨,٧١	69	B	
١,٤٢	٣٢,٥٣	63	A	Barren Rocks
1.83	٤١,٩١	77	B	
١,٠٦	٢٤,٢٨	77	A	Barren Soils
1.62	٣٧,٠٥	85	B	
٠,٤١	٩,٤٥	77	A	Urban Area
0.13	٣	85	B	
٦٤,١٦	١٤٦٥	68	A	Herb Plants
6.28	١٤٣,٤٠	79	B	

Fig 5: **A** (Rainfall Map mm) **B** (Runoff Map mm) **C** (Runoff Coefficient Map)

Table 3: Average Rainfall - Runoff Depth of kaam Sub-Watershed for Season (1980-2000).

Sr.no	Sub Watershed	Area (km²)	Storage Coefficient (S) mm	CN	Rainfall (mm)	Runoff (mm)
1	Sub1	153	141.6	64	284.60	165.07
2	Sub2	460	182.4	58	268.35	129.78
3	Sub3	547	147.6	63	204.07	94.57
4	Sub4	516	114.6	68	264.39	163.75
5	Sub5	602	106.2	70	212.10	122.63

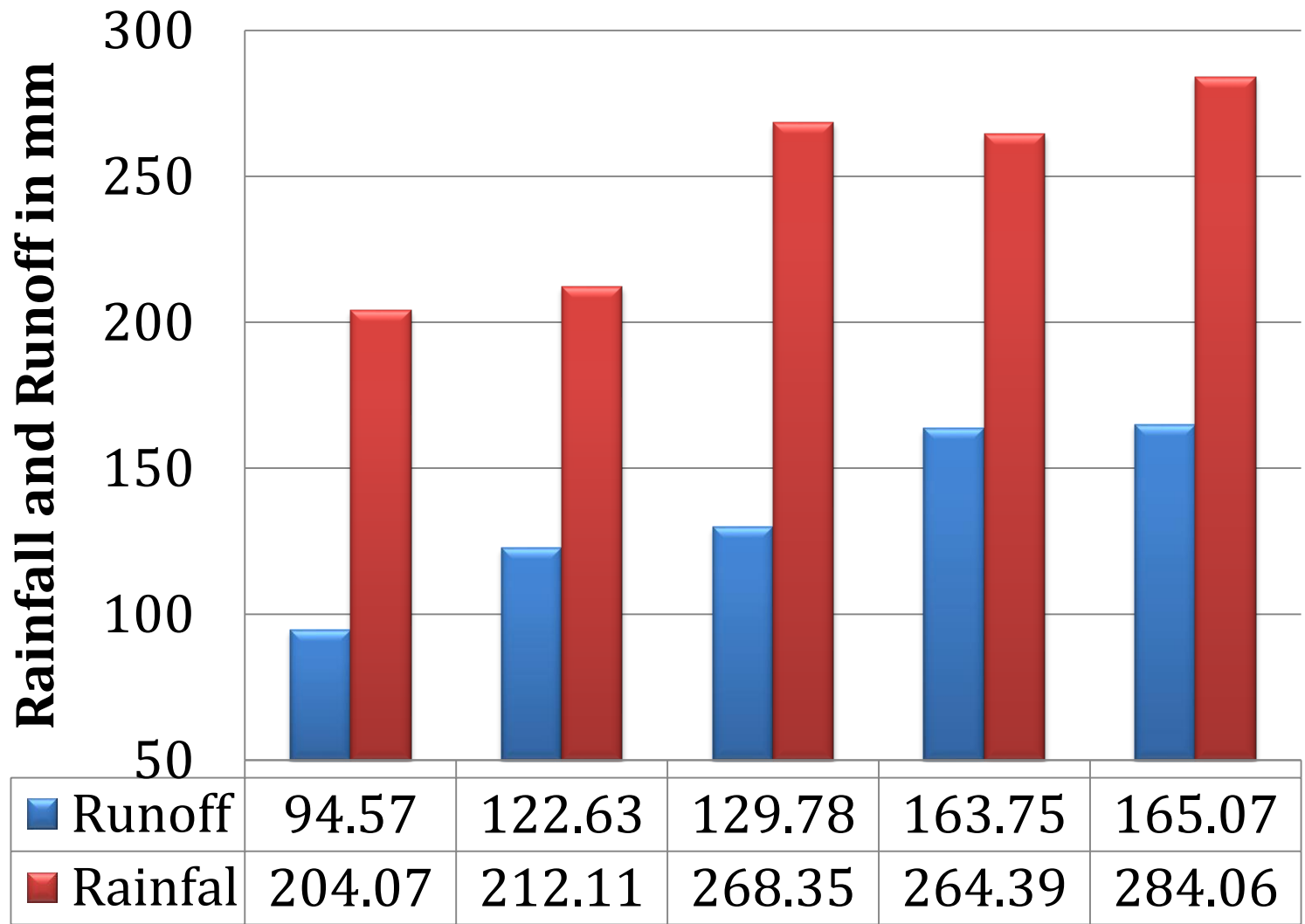|					
■ Runoff	94.57	122.63	129.78	163.75	165.07
■ Rainfal	204.07	212.11	268.35	264.39	284.06

Fig 6: Graph of Rainfall-Runoff rate for five sub-watersheds of period 1980 – 2000
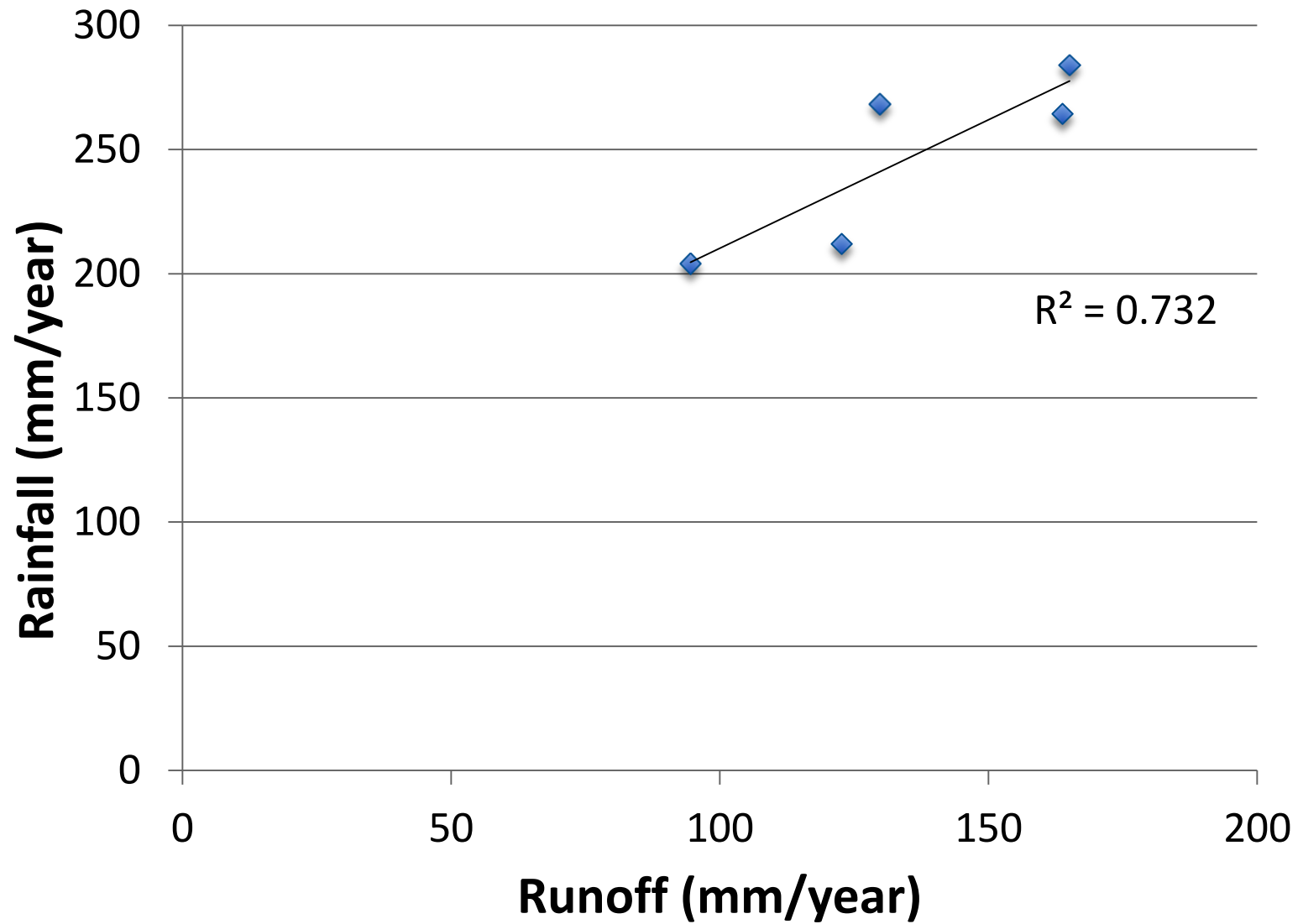
Fig 7: Relationship between Average Rainfall and Runoff from (1980-2000)

Conclusion & Recommendations

- Remote sensing and GIS with application of SCS-CN model proves to be a powerful tool for runoff estimation. That can be recommended for better management of land and water resources for sustainable development of the watershed.

- The major advantage of employing GIS in rainfall-runoff modelling is that more accurate sizing and catchment characterization can be achieved.

- The study recommends take advantage of runoff rates by reserving them at collection of sub basins and then using them for agricultural purposes in the vicinity. This would be better than reserving water from the total area of the basin, which is 2283 square kilometers.

Thank you for your attention