

Using GIS in Water Harvesting

By: Manal Daoud Salih– Water Harvesting Unit
Mohammed Mustafa- Water Harvesting Unit
Ministry of Irrigation &Water Resources - Khartoum-April 2011
manal_salih2002 @ yahoo.com
00 249 129 90 103
00249918335550

Introduction

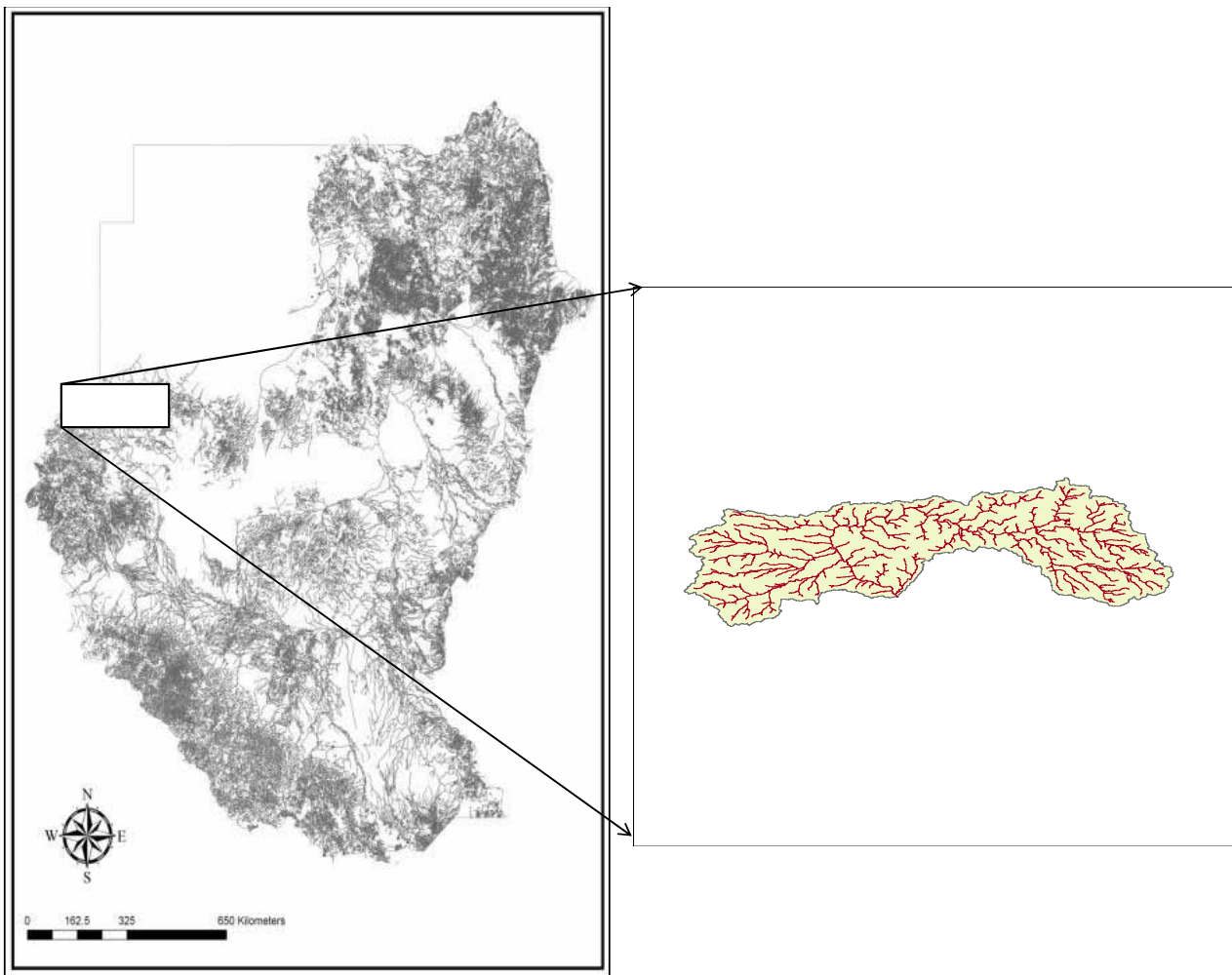
- Many areas in arid-semi arid zone are severely affected by water shortage.
- What is water harvesting techniques
- ✓ water harvesting techniques requirements:
 - Annual rainfall
 - Terrain
 - soil permeability



- RS- Gives general view for WR which help in survey ,mapping ,planning.
- GIS-Permit saving of data &information in digital form
- Integration of RS&GIS-build the database for water resources

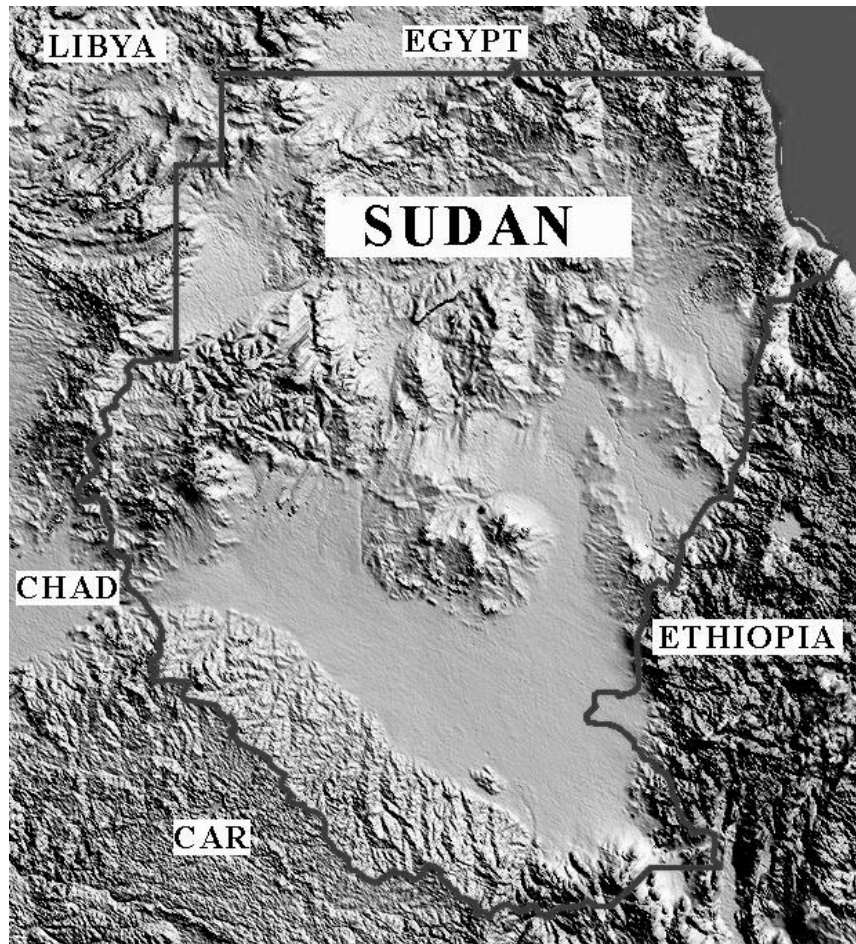
PROJECT AREA

- The selected area located in Darfur region which is the western wing of Sudan with total area of 500,000 km². It lies between latitudes; 8 to 20° N and longitudes 22° to 27° 30' E. The region has international borders with Libya, Chad .
- Wadi Aradieib is located in North Darfur state near the borders with Chad, and to the northern west of Alflashir, its located between latitude 15° 3' 43"N and 14° 32'.49"N, and longitude 22° 5' 40.13"E and 24°26'36.82"E. It is the main tributary for Wadi Kaja. Wadi Aradeib join with Wadi Abu Sunt near Taziriba Village and they create together Wadi Kaja.



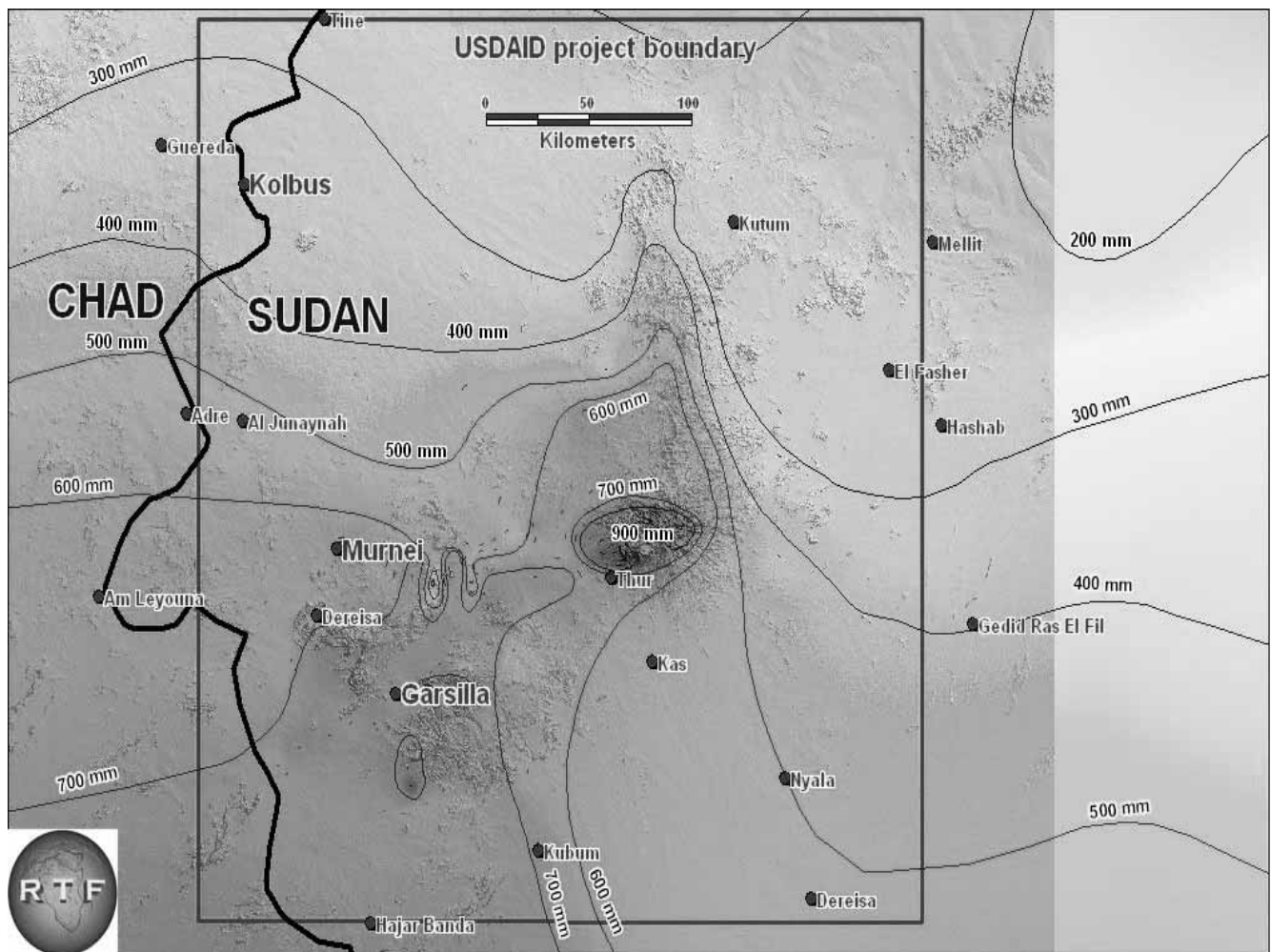
Objective

- General objective:
 - ✓ To benefit from rainfall in development
- Special objective
 - I. Drainage mapping of wadi sira
 - II. Data base for run off
 - III. Delineate watershed ,wadies and small stream
 - IV. Locate site for water harvesting



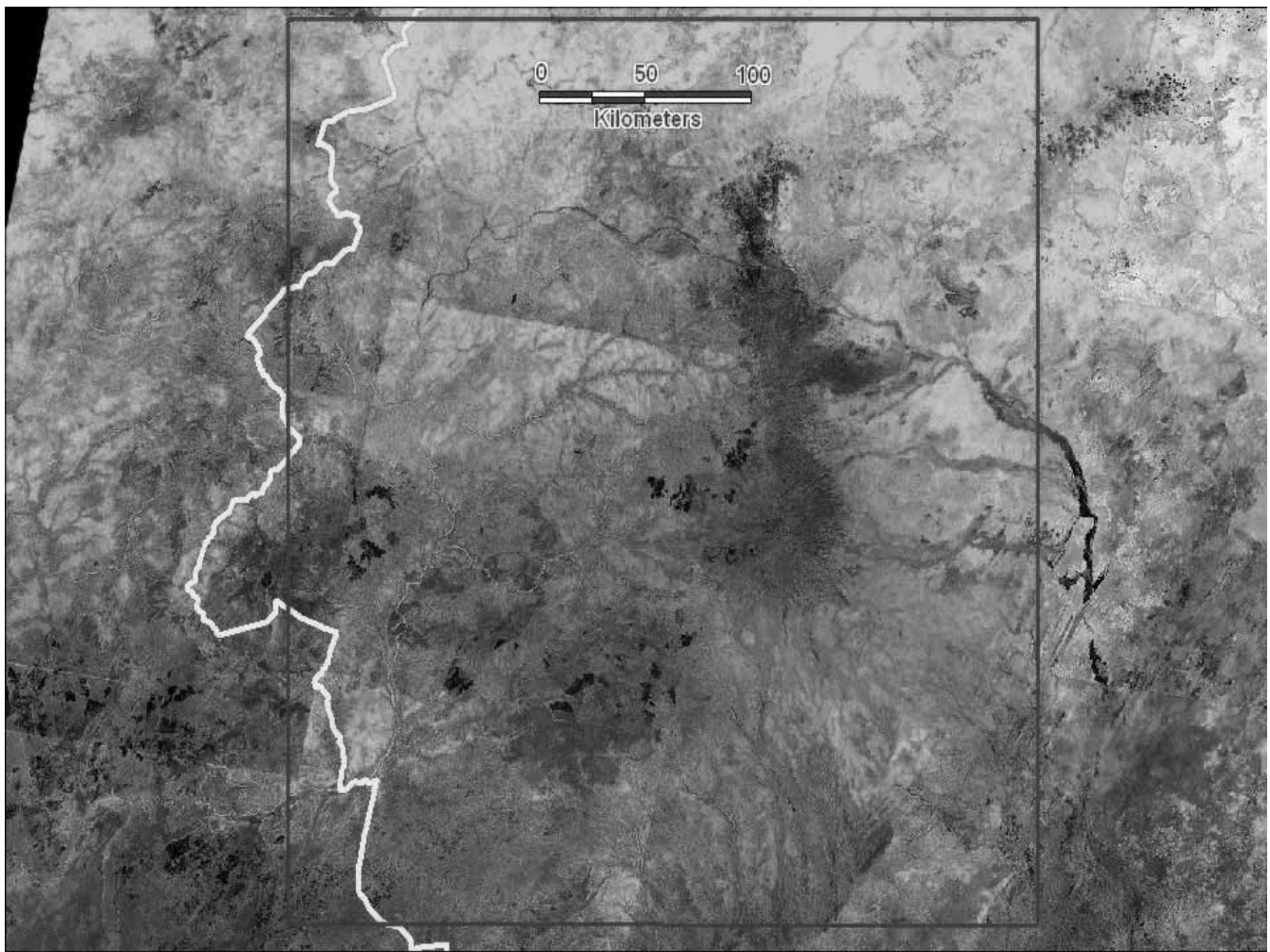
- **Data Sources:**

- **landsat7(TM,ETM+)**
- **DEM (SRTM 90 m)**
- **Sudan Topo sheet**
- **Soil Map**
- **africover Land use Map**
- **Metrological data**



The software

- For RS:
 - ❖ ERDAS IMAGING 9.1
- For GIS:
 - ❖ ARC GIS 9.3
- Other:
 - ❖ Google Earth
 - ❖ WMS Model



Feasibility

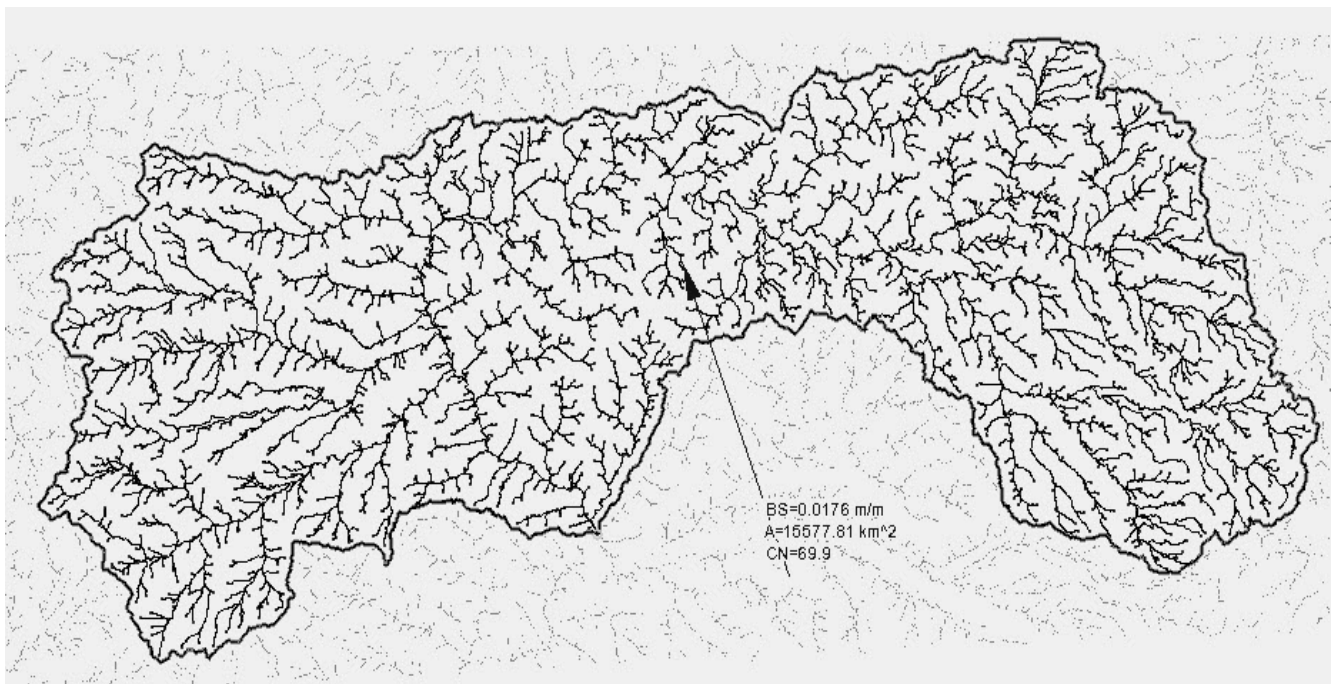
Are water harvesting support local pepole?

- **The GIS introduced a wide range of CRITERIA for the suitable location of the water harvest to be of benefit and to be utilized by the communities.**
- **Include:**
 - **slope.**
 - **Distance from villages**
 - **Site should be within main drainage course**
 - **Suitable permeability**

Methodology

- The collected data were used to delineate the watershed, create the stream network, develop the basin characteristic file, extract the estimate rainfall
- The Extract DEM for Wadi sira converted to ASCII file to suite the WMS environment to delineate the basin boundary, area, drainage and the slope

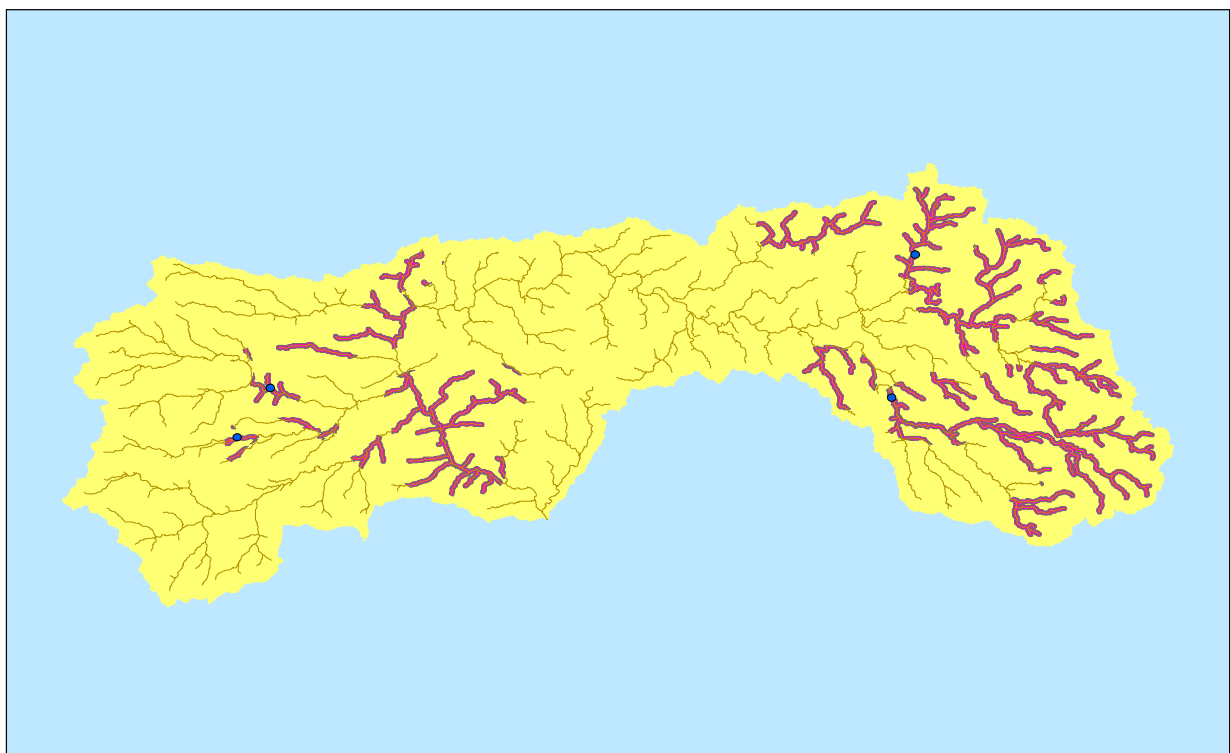
SUITABLE AREA FOR WATER HARVESTING(WADI SIRA)



THE RUNOFF COEFFICIENT:

- Establishment Soil Map for the wadi sira.
- Establishment Land use Map clipped from Sudan Africover.
- The two map used to produce the Curve Number (thus prepare the running environment for model) which is found to be 69 for the wadi
- Using maximum storm of 60 mm rainfall to run the WMS model the total volume of water found to be 76million cubic metre .

THE SUITABLE SITE FOR WATER HARVESTING



Constrained

- **Technical constrain to the source of data - the following is needed**
 - (i) High resolution satellite images
 - (ii) High resolution DEM,
 - (iii) Up dated Sudan top sheet
 - (iv) Up dated soil and land use maps
 - (v) For rainfall it should be noted that no available current runoff and rainfall records in the study area except that from Alfasher city(the nearest))

CONCLUSIONS

The following conclusions could be drawn from this study:

- The different characteristics of watersheds are estimated using Geographic information system (GIS) techniques. It was found that the total catchment area is 35713 km², the total length of stream is 245321 km; the mean curve number is 69
- . This primary work is especially suitable this area because it un accessible far area which need water harvest for better development.
- The GIS is efficient tool for locating the best water harvesting areas& site if an accurate data available
- Afield visit is important for validation.

Recommendations

It is recommended that the following should be done in future studies:

- ☺ Ground validation of the suggested area for water harvesting for better water resources evaluation.
- ☺ Provision of more observed runoff data to run the (WMS) model for better estimation of watershed yield.
- ☺ Integration hydrologic and hydrogeologic study of the area to evaluate the resource from all points of view (quantity and quality)
- ☺ using high resolution data sources for GIS and RS
- ☺ using updated maps for soil and land use for more accurate curve No.

THANK YOU