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K ( GIS USLE K )

GIS SDR :

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( $\tau_c$ )

(K<sub>d</sub>)

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- Tesngwen  
 - Benin Bende –Ameki  
 - Imo

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- Protodyakonov  
 - Rzhovsky & Novik  
 - Kerkaldi et al  
 - Johnson et al  
 - Annandale

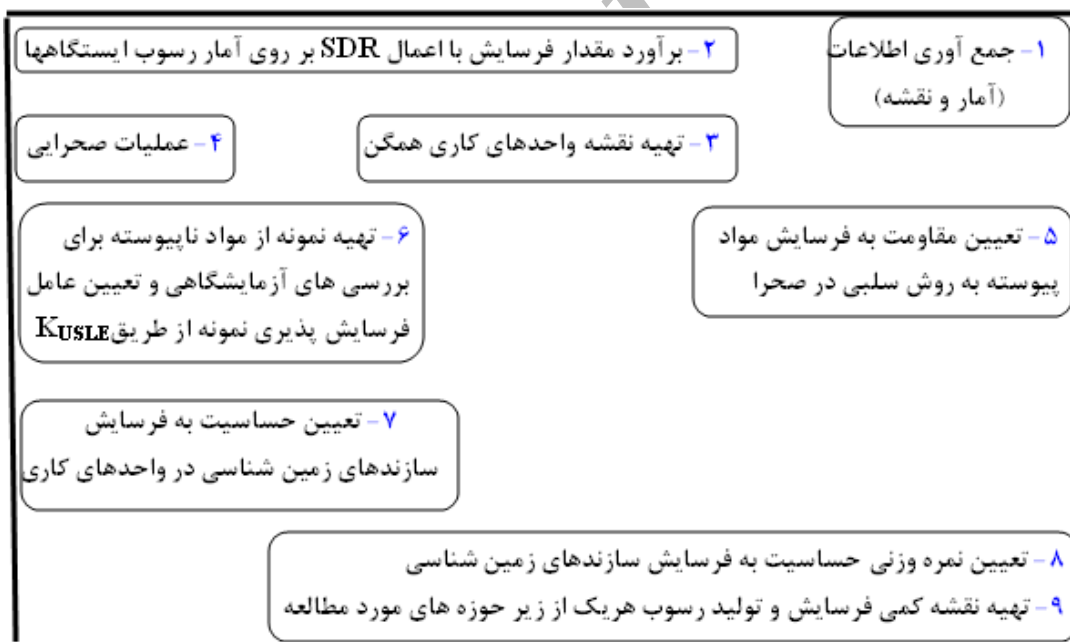
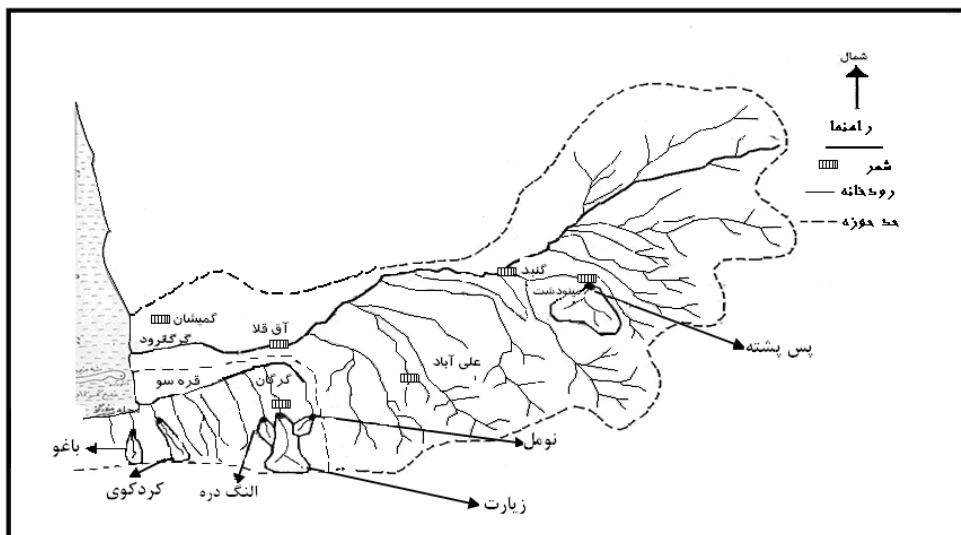
$Q^L$  PLQ  $Q^{sc}$   $Q^c$  ( ) ( )  
 $Q^{al}$  (  $Q_{t2}$  ) BLM ( )  
 ( ) ( )  
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. ( )  
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GPS N  
 (Arc/view , ) (Arc/info ) (R<sub>2</sub>V)  
 (Excel) (Idrisi)

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( )  
 Gb  
 ( )  
 $D_{kh}$   $D_p$   $O^{sch}$   
 $D_c$   $\epsilon_m^L$   $C_m$   
 (Sb)  
 ( )  $J_s$   $J_L$  )  
 (  $K_1^L$   $J_k^{sd}$  ,  $J_k^{ss}$  )  $j_{mz}$



(Flow chart)

|         |           |                    |  |
|---------|-----------|--------------------|--|
|         |           |                    |  |
|         |           | (km <sup>2</sup> ) |  |
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| ' " ' " | "         | /                  |  |
| ' " ' " | ' " ' "   | /                  |  |
| ° ' ' " | " ' "     | /                  |  |
| ' " ' " | ' " ' "   | /                  |  |

SDR

|                          |  | SDR                            |     |
|--------------------------|--|--------------------------------|-----|
| (Km <sup>2</sup> ) :A    |  | SDR = / A ' R <sup>2</sup> = / | ( ) |
| (Mi <sup>2</sup> ) :A    |  | = / A ' / SDR                  | ( ) |
| (Km <sup>2</sup> ) :A    |  | SDR = A '                      | ( ) |
| :D (Km <sup>2</sup> ) :A |  | D= / / Log( / A) / Log         | ( ) |
| :D (Km <sup>2</sup> ) :A |  | Log D= / / LogA                | ( ) |
| (Mi <sup>2</sup> ) :A    |  | SDR= / A '                     | ( ) |
| (Mi <sup>2</sup> ) :A    |  | SDR= / A '                     | ( ) |

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- Larence
  - Vanoni

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( ) (S.D.R) (SDR) SDR

K USLE SDR SDR ( )

K SDR ( )

( ) SDR

k = k =

K USLE K ( )

USLE K ( )

( )

( )

20-40% 40-60% 60-80% 100-80%  
60-80% 40-60% 20-40% 0-20%

% % GIS Arc/view

USLE % % GPS

USLE

( / /

μ mm

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| ( ) | ( ) | ( ) | ( ) | ( ) |     |
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( ) :

$E_i$   $i$   $E_t$   $i$   $:Esp_{(i)}$   $( )$   
 $A_i$   $i$   $:A_t$   $i$   $( )$   
 $:Q_{max}$   $:K$   
 $:Q_i$   
 $: Esp_{(L)}$   $i$   $j$   $( )$

Excel Solver

$(Esp_{(B)})$   $(Esp_{(i)})$

$( )$   
 $( )$   
 $Esp_{(B)} = \sum Esp_{(i)}$   
 $( )$   
 $Esp_{(i)} = K \frac{Q_{max} - Q_i}{Q_i} Esp_{(L)}$   
 $( )$   
 $Esp_{(i)} = \frac{(E_i / E_t)}{A_i}$

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

$( )$   
 SDR  
 SDR  $( )$  SDR  
 $(SDR = / )$   
 $( )$  SDR  
 $( )$



( )

SDR

|   |   |   |   |   |         |
|---|---|---|---|---|---------|
|   |   |   |   |   |         |
| / | / | / | / | / | ( ) SDR |

| (ton/yr) | SDR | (ton/yr) | (ton/yr) | (ton/yr) |  |
|----------|-----|----------|----------|----------|--|
| /        | /   |          | /        | /        |  |
| /        | /   | /        | /        | /        |  |
| /        | /   | /        | /        | /        |  |
| /        | /   | /        | /        | /        |  |
|          | /   | /        | /        | /        |  |
| /        | /   | /        |          | /        |  |

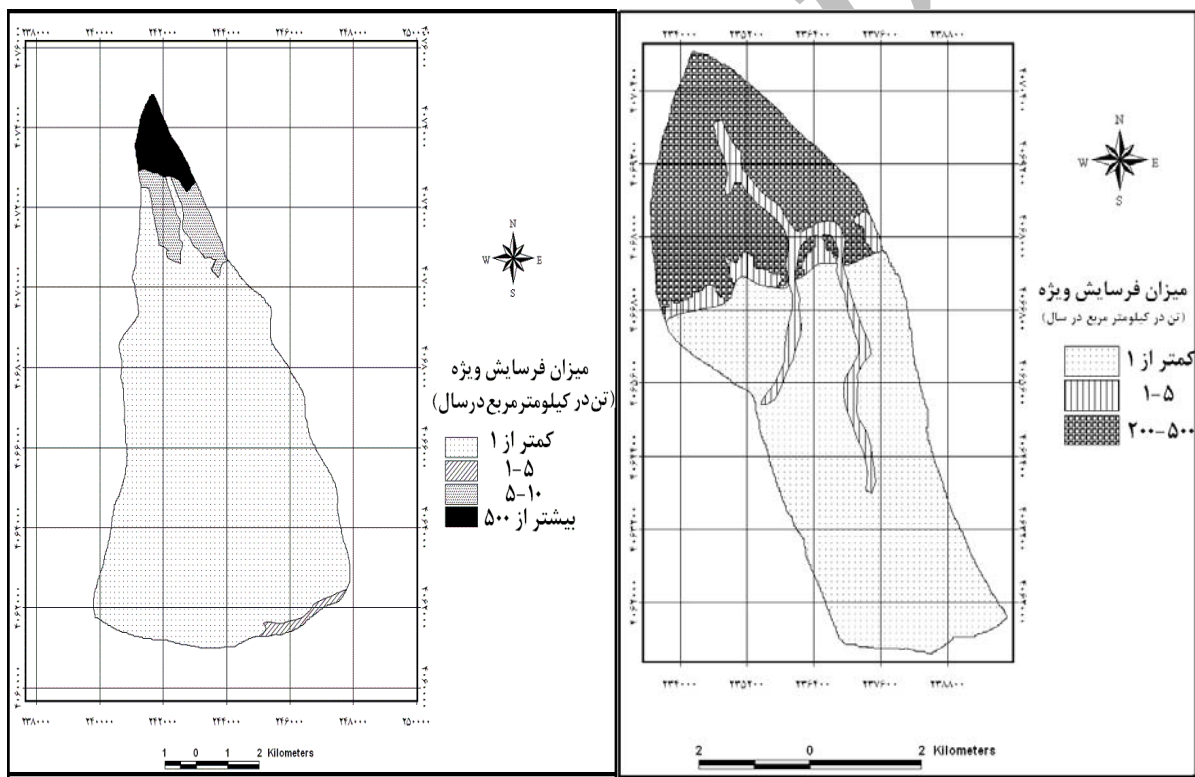
$Q_{t2}$   $Q^{al}$   $Q^{sc}$   $Q^c$   $Q^L < K_1^L$   $J_k^{ss}$   $C_m^L$   $D_c$   $J_s < PLQ$   $J_k^{sd}$   $j_{mz}$   $D_{kh}$   $D_P$   $C_m$   $J_L < Sb$   $O^{sch} < Gb$

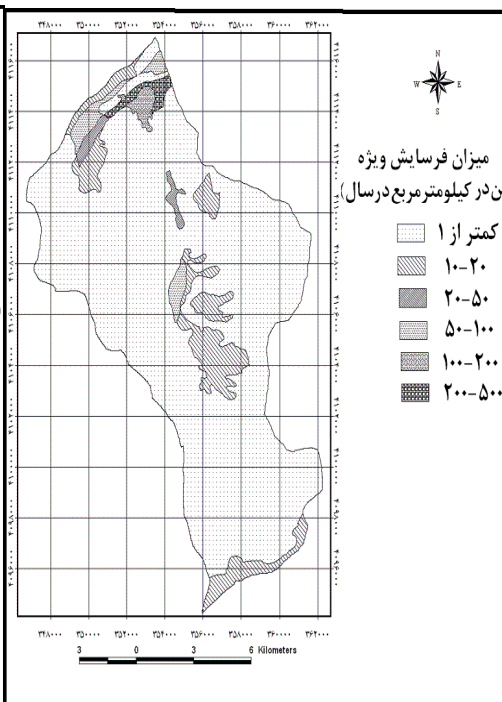
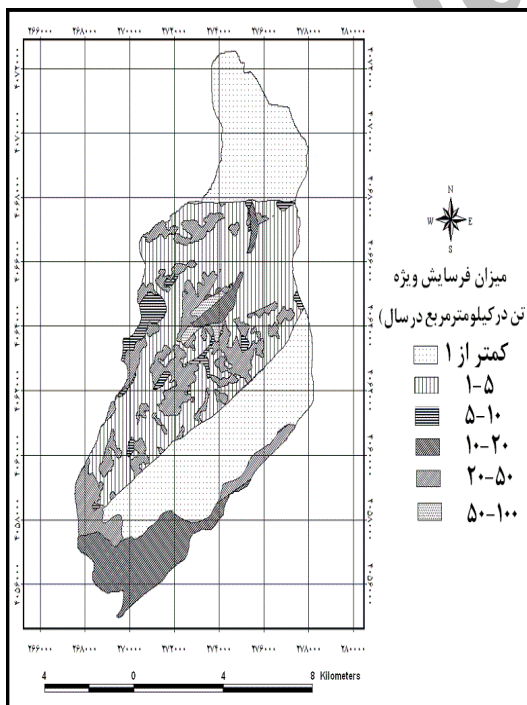
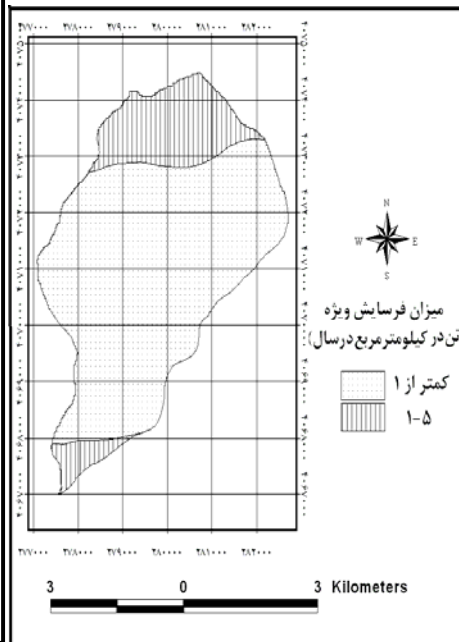
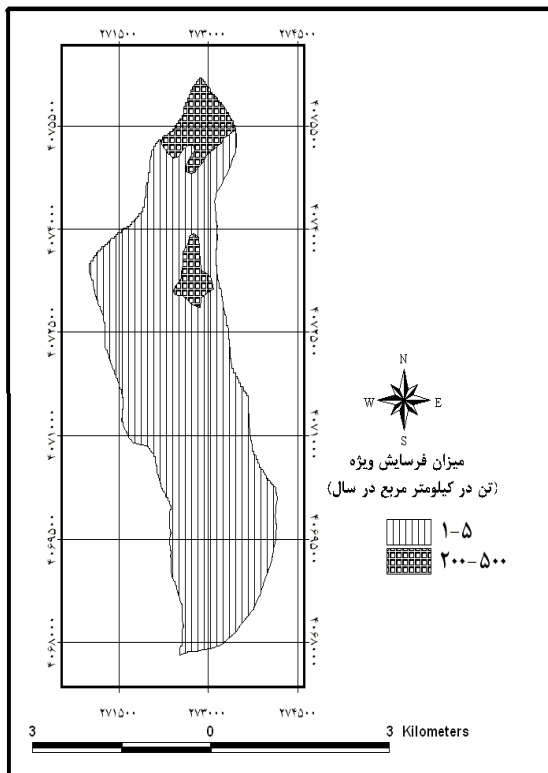
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(K)

|   |   |   |   |   |   |   |   |     |                           |
|---|---|---|---|---|---|---|---|-----|---------------------------|
|   |   |   |   |   |   |   |   | (K) |                           |
| / | / | / | / | / | / | / | / | /   | (ton/km <sup>2</sup> /yr) |





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$K_{USLE}$

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## Investigating sensitivity to erosion and sediment yield of formations in Gorgan Drainage basin

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### Abstract

In this research, six sub-catchments of Gorgan Drainage Basin having discharge and sediment yield data were chosen. Yearly sediment rates of each sub-catchment were calculated. Then by dividing yearly sediment yield of sub-catchments to Sediment Delivery Ratio (SDR), the amount of erosion of each sub-catchment was determined. Homogeneous work unit map of each sub-catchment in GIS environment was prepared. Then, the erodibility of consolidated rocks and formations (Selby 1980) and unconsolidated geologic materials (modified K parameter in USLE) was determined. For ranking the erodibility of consolidated and unconsolidated geologic materials in the specific range (Selby number), the method of distance between numbers was used. For comparing different work units from the view point of erodibility and sediment yield, based on qualitative erodibility grade and specific erosion amount of land uses, specific erosion of each homogeneous work unit was calculated by using presented relationships. The results showed that the erodibility grade of rocks is from 34 to 86 and of unconsolidated geological materials is from 13 to 22.3. Also specific erosion of different work units in sub-catchments is from less than one up to 500 t/km<sup>2</sup>/y.

**Keywords:** Annual sediment yield, Work unit map, Sensitivity to erosion, Specific erosion, Gorgan drainage basin

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