Lab -2 Soil and water Conservation / Practical

 3th stage Soil and water Dep.

**Indirect estimation of rainfall erosivity:**

In most of the existing station in our region and other regions over the world there is lack of data especially data. Which has relevance with rainfall intensity , that there is not recording rain gauges. It is useful to predict rainfall erosivity from rainfall depth using different models.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| # | Formula | Input parameters | Rainfall erosivity | Author |
| 1 |  | pi= monthly rainfall; P= annual rainfall (mm) | 523.88 | Wischmeier and Smith (1978) |
| 2 | R = 0.302 F1.93 |  where F is Fourner's index,  | 824.35 | Arnoldus (1977) |
| 3 | **R = 4.17 F – 1.52** | F= Fourner's index | 249.96 | Arnoldus (1980) |
| 4.  | R= 4.0412 P – 965.53 | P = annual rainfall | 690.96 | Ferrari et al.(2005)- linear |
|  5 | R = 0.092 x P1.4969 | P = annual rainfall | 749.39 | Ferrari et al.(2005), -exponential |
|  | Average value of rainfall erosivity | 607.71 |

**Indirect models:**

**1. Annual precipitation (rain depth) (P).**

 

 **P = P1+ P2 + P3 +……. Pn**

P=Annual rainfall depth

P1= Rainfall depth in (mm)for the first raining month

Pn= The monthly rainfall depth in (mm) for the nth month

 n = Number of raining month.

**2. Fourner's index (F): Arnoldus (1980)**



**F =**$ \frac{1}{P} [($**P1 )2+ (P2 )2+ ………+ (Pn)2]**

F = Fourner's index(mm)

P = Annual rainfall depth(mm)

Pn = The monthly rainfall depth in (mm) for the nth month

**# Rainfall erosivity:**

 **R = 4.17 F – 1.52**

R = $\frac{MJ}{ha yr}$ .$\frac{mm}{hr}$ ÷ 10 **→** R = $\frac{ton}{ha yr}$ .$\frac{cm}{hr}$

Example:

Calculate the rainfall erosivity for Erbil city using **Fourner's index (F): Arnoldus (1980).** For a station recorded the following information:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dece. | Nov. | Jan. | Feb. | Total |
| 30 | 40 | 50 | 60 |  |

 **P = P1+ P2 + P3 +……. Pn**

P= 30+40+50+60

P= 180 mm

**F =**$ \frac{1}{P} [($**P1 )2+ (P2 )2+ ………+ (Pn)2]**

F= 1/180 [ (30)2+(40)2+(50)2+(60)2 ]

F= 1/180 [900+1600+2500+3600]

F= $\frac{8600}{180}$ = 47.7 mm

 **R = 4.17 F – 1.52**

R= 4.17(47.7) – 1.52 = 197.389 $\frac{MJ}{ha yr}$ .$\frac{mm}{hr}$
R= 197.389 $\frac{MJ}{ha yr}$ .$\frac{mm}{hr}$ $÷$ 10 → R= 19.7 $\frac{ton}{ha yr}$ .$\frac{cm}{hr}$

**Estimate rainfall depth for half of month:**

**P1 = M[** $\frac{0.75\left(M-1\right)+ 0.25(M+1)}{\left(M-1\right)+ (M+1)}$**]**

**P2 = M [** $\frac{0.25 \left(M-1\right)+ 0.75 (M+1)}{\left(M-1\right)+ (M+1)}$ **]**

M = The month you are calculate

M + 1 = Rainfall depth in the next month

M – 1 = Rainfall depth in the previous month

Example:

Estimate of rainfall depth erosivity for half month .If you have the following data.

|  |  |
| --- | --- |
| Feb. | 50 |
| March | 80 |
| April | 40 |