

## **APPLICATION OF THE MODEL WEPP FOR THE EVALUATION OF RUNOFF AND SOIL EROSION IN A SEMIARID REGION OF BRAZIL.**

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The north-eastern region of Brazil is predominantly semiarid with an annual precipitation of 800mm or less. In this region, agriculture is the principal vocation of subsistence and the results depend much on the nature of the rainfall. The techniques of cultivation are mostly manual and no special measures are taken by the rural farmers to protect the land from erosion and consequent loss of productivity. The precipitation regime with its large temporal and spatial variations results in considerable land erosion during precipitation and runoff periods. The knowledge of the amount of surface runoff generated and the associated soil loss is extremely important for any rational planning of hydrological basins. This paper describes the experience obtained with the use of the physically based model WEPP (Flanagan & Nearing, 1995) in the evaluation of the surface runoff and soil erosion in a semiarid region of Brazil utilizing data obtained from erosion plots and micro-basins in two different experimental basins with in the region.

The Experimental Basin of Sumé (EBS) is located in a private farm called "Fazenda Nova" is a part of the representative basin of Sumé (137.4 km<sup>2</sup>). More than 85% of the basin is covered by brown non-calcic vertic soils, typical of the Brazilian semiarid regions (Srinivasan & Galvão, 2003). The field studies were carried out at three different scales: micro-basins with an area of around 0.5 ha; standard Wieshmeier type erosion plots of 100 m<sup>2</sup> and, sample plots of 1 m<sup>2</sup>. In all, four micro-basins and nine erosion plots of 100 m<sup>2</sup> were installed and equipped for the determination of the total runoff and total sediment yield for each of the events of precipitation observed. The field installations were carried out between 1982 and 1986. The four micro-basins were chosen so that they may typically represent the prevailing vegetal cover and the natural slopes. Two of them were cleared bare of any vegetal cover and during the operation of these basins, they were periodically cleared of any resurgent surface vegetation, thus, maintaining the bare soil surface. All the micro-basins and erosion plots were equipped with sediment and runoff collectors.

The Experimental Basin of Sumé ceased functioning from 1992 and in order to maintain the collection of runoff and erosion data in the region two erosion plots and three micro-basins were installed progressively in a neighboring municipality of São João de Cariri. The experimental station was located within a very similar hydrological area as that of Sumé.

The model WEPP developed by the USDA is a continuous simulation model that generates runoff and soil erosion based on the physical processes of runoff generation as well as the erosion, transport and deposition processes of the surface soil ( Flanagan & Nearing, 1995, Foster et.al., 1995). The present study is an attempt to evaluate the model

under the semiarid conditions of the northeast of Brazil. An important difference in the present study is that the most important parameters were estimated through a process of calibration and a subsequent validation was carried out using data from another erosion plot and micro-basin. The data from the bare soil erosion plot 1 in Sumé was used for calibration and the events in plot 4 (also bare) were simulated utilizing the mean values of the parameters: the effective saturated hydraulic conductivity  $K_e$  and the interrill soil erodibility parameter  $K_i$ , obtained in plot 1. This served as a validation procedure for the estimated parameter values. Calibrating  $K_e$  event-wise and using the mean value of  $K_i$  from plot 1, the rill erodibility parameter  $K_r$  was calibrated for each of the events with data collected in the bare soil micro-basin 3. Utilizing the mean values of the three parameters from this micro-basin, the events in the neighboring micro-basin 4 (also with bare soil surface), were simulated for the purpose of validation. The coefficient of determination  $R^2$  of 0.98 and 0.99 between simulated and observed values of runoff and erosion obtained here, substantiate the validity of the parameters of the WEPP model for the region of Sumé. In the case of the experimental units of São João de Cariri, all the observed events were used to estimate the parameters through calibration. These parameter values were quite close to the ones obtained for the micro-basin 3 of Sumé located about 60 km away. Thus, the applicability of regional values of these parameters seems to be valid and the model WEPP may be effectively used as a predictive tool in the semiarid region of the present investigation.

#### REFERENCES

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