Assessment and Prediction of Soil and Water Loss in Red Soil Hilly Regions of Southern China

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Abstract: The red soil hilly area in the south is second to the serious soil and water loss area of the Loess Plateau. Due to the many causes of soil and water loss, the detailed scientific assessment and prediction of soil and water loss in the red soil hilly area in the south are needed to improve water and soil management and protection Work efficiency, so as to control and solve serious soil erosion problems as early as possible.

1. Introduction

The area covered by the red soil hills in the south covers an area of 871,500 square kilometers, of which 131,200 square kilometers are soil and water loss areas, accounting for about 15.06% of the area under investigation. In terms of farming, nitrogen, phosphorus, and potassium are taken away every year due to soil and water loss. The total amount is about 1.28 million tons. From 1984 to 2004, the area of cultivated land decreased by 2.32 million hectares. The amount of soil in the study area decreased, the quality deteriorated, and the productivity of land decreased. In terms of natural disasters, the sedimentary river channels raised the river bed, reducing In terms of storage capacity, the flood control capacity has decreased accordingly. Economically, severe soil erosion has also restricted the process of poverty alleviation. According to statistics, there are 48 national poverty-stricken counties in the southern red soil hills survey area, which are basically distributed in hills with severe soil erosion. Mountain area.[1]

The CSLE model is a Chinese soil erosion calculation model established by Liu Baoyuan and others based on the actual conditions of soil and water conservation in China. It fully considers the effects of biological measures, engineering measures, and farming measures on the process and results of soil erosion and soil erosion, and the topography of China. The characteristics of the landform take into account factors such as rainfall, soil, vegetation, terrain, and measures, which improves the accuracy of quantitative calculation of regional soil erosion.[2]

2. Model Establishment and Solution

2.1 Rainfall Erosion Factor r

At present, the mainstream calculation method of the rainfall erosion factor R in China is Zhang Wenbo's daily rainfall erosivity model [6]. Since some data required by this model are not included in the annex, we can't speculate, so it is not suitable for this topic.

Although it is not suitable for solving, in the process of studying the daily rainfall erosion force model of Zhang Wenbo [3], we found that the annual rainfall erosion force can be obtained by accumulating the daily rainfall erosion force. In the CSLE model, the rainfall erosion factor R is generally used Annual rainfall erosivity factor. Combined with the daily rainfall erosivity Rd data given in the attachment, the required annual rainfall erosivity Ry can be calculated to obtain the rainfall erosion factor R.

$$RY = \sum_{i=1}^{k} Rd$$

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2.2 Soil Erodibility Factor K

At present, there are two mainstream calculation methods for soil erodibility factors in China: the Norm formula method and the EPIC formula method. Among them, the Nomo formula method involves many parameters, and the result classification criteria are vague and inconvenient. Qualitative analysis afterwards.[4] So we used the calculation method of soil erodibility factor developed by William et al in EPIC model.

First, the sand content, silt content, clay content, and organic carbon content (in%) in the soil of the three runoff communities need to be determined. The attached data provides the soil organic carbon content at three monitoring points of A, B, and C. Soil type. Among them, the soil types of A and C are red soil, and the soil type of B is purple soil. SaSiClC

By observing the attached data, we found that the plant species, plant coverage, biological measures, seedlings, etc. of Site A are all 0; the site of B is the bare land along the slope, and the data of vegetation is also 0; the plant types and plant cover of C Rate, biological measures, seedlings, etc. are also 0. Based on this, we speculate that the three places are all bare.

Therefore, according to the research results of Zheng Haijin et al. we obtained the red soil soil particle composition data in the red soil area of southern China under the bare land use method; according to the research results of Shi Dongmei et al. purple soil was obtained. The soil particle composition data under the bare land planting mode.[5] Based on the above information and the information given in the attachment, the information required for calculation can be summarized.

2.3 Slope Length Factor l and Slope Factor s

Slope length factor L and slope factor S, as the basic natural geographical elements showing the terrain and terrain trend of a region, play a key role in the formation and development of soil erosion. Slope length factor L refers to the same amount of soil erosion per unit area under any slope length. The ratio of soil erosion per unit area under the slope length of the standard plot under the conditions. The slope factor S refers to the ratio of the soil erosion per unit area under any slope to the soil erosion per unit area under the standard plot slope under the same conditions.

When calculating the slope length factor L, the empirical formula proposed by Wischmeier et al. Is used; when calculating the slope factor S, the calculation formula established by Liu et al. On the Loess Plateau is used.

3. The Main Reasons for Serious Soil Erosion in the Red Soil Hilly Region of the South

According to the information, other major reasons for serious soil erosion in the red soil hilly region of the south are as follows

First, the terrain is broken and the slope is large. It belongs to the typical low mountain and hilly area. The terrain is broken and the slope is large, which causes the terrain conditions that are easily eroded.

Secondly, the quality of vegetation cover is low. At present, a prominent problem in the management of soil and water loss in the red soil region of the south is “underflow”. Churn.

Third, collapse and erosion are severe. Collapse is a special form of soil and water loss in the red soil hilly region of the south [7]. The average soil erosion modulus of the collapsed area is as high as 59,000 t / (km2 · a), which is the standard of severe erosion in the national standard 4 times or so.

Fourth, spotted distribution, strong concealment, and great potential danger. The soil and water loss in the red soil hilly areas in the south is mostly spotted, and there are few concentrated distributions. It is basically on the national soil erosion map of 1: 4 million. Gap, this distribution feature masks the real phenomenon of soil and water loss and is easily ignored by people.

4. Conclusion

The soil and water loss in the red soil hilly region of the south is serious, and different treatment areas need to be refined. The most suitable treatment plan is given according to the local conditions. The rainfall erosivity is high, the terrain is broken and the slope is large, the vegetation coverage is

low, the collapse erosion is severe, and the spots are distributed. , High concealment, and great potential danger. These 5 points are important reasons for soil and water loss in the red soil hilly areas of the South, which are different from the Loess Plateau and other areas. They should be given sufficient attention and placed on the locations that need to be firstly conquered. Southern red soil hilly areas Soil and water management work has been carried out for nearly 70 years. At the same time, we are sad to see the fact that the area of soil and water loss is increasing. Responsible persons should seriously consider and explore the space for progress. At the same time, combine modern technology to maintain scientific and technological progress. Promote ecological compensation mechanisms.

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