Research on Optimal Allocation of Gully-Slope Surface Treatment Project

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Abstract

Establish demonstration areas in key areas of erosion gully prevention and control in the loess hilly and gully area, and carry out research on the optimal allocation of gully prevention and control measures. By combining specific control measures in the demonstration area, studying the benefits of optimized allocation of gully control measures on agricultural production, farmers' income, ecological environment, etc., a relatively complete erosion gully prevention and benefit evaluation system has been established to provide erosion gullies in loess hilly areas. Road prevention and control model trials, demonstrations, and promotion provide a reference for the entity model.

Keywords

Slope; Research Progress; System; Slope-ditch.

1. Introduction

With the continuous expansion of the restraining effect of the ecological environment on economic development, the state has paid more and more attention to water and soil conservation, and the improvement of slopes and gullies is becoming more and more urgent. In order to prevent the further development of channel erosion, it is very necessary to control the slope and channel on the basis of comprehensively grasping the characteristics of the erosion channel. In the process of selecting the treatment method, the treatment should be based on the gully, and the relevant characteristics of the gully should be fully considered to achieve significant results. At the same time, attention should be paid to the information management of erosion slope and gully prevention and control, and related engineering measures should be optimized to improve the erosion slope. And the level of trench prevention technology.

2. Measures to prevent

In order to avoid the further development of the erosion channel, after analyzing the characteristics of the regional erosion channel, measures need to be taken to control the channel. Engineering measures, biological measures and water storage and soil conservation farming measures are the main measures of water and soil conservation. To carry out water and soil conservation work, it is necessary to follow the laws of nature and on the basis of comprehensive planning, adapt measures to local conditions and fortify disasters, and control soil erosion to the greatest extent, so as to achieve the purpose of protecting and rational use of water and soil resources and achieving sustainable economic and social development. Combined with the analysis of the characteristics of the erosion ditch, measures should be taken to increase infiltration, reduce confluence, reduce erosion speed, and slow down or prevent trench undercutting, etc., so that measures should be taken according to local conditions, fortification due to damage, and treatment due to ditch. In the process of selecting channel treatment methods, manpower should be taken from the following perspectives: (1) Considering from the perspective of hydrology, in order to slow down or stop the development of erosion channels,

measures should be taken to slow down the flow rate and decrease the flow rate. Therefore, fish-scale pits or terraces can be built according to the slope and soil conditions in the area where the channel is located. While increasing infiltration, the infiltration flow can be further utilized to improve the regional water environment. (2) From an ecological point of view, in order to increase the surface roughness, increase infiltration, reduce runoff, delay the runoff process and weaken the energy of runoff, plant measures have played an extremely important role. First, the root system of vegetation can promote rainwater infiltration and reduce the formation of ground runoff. At the same time, the root system can hold the soil and make the surface material stable. Secondly, the canopy of vegetation can intercept rainfall and reduce rainfall in a large area. The impact of small raindrops on the ground surface; again, the litter produced by vegetation covers the surface of the soil, which can conserve water, reduce the conversion of rainfall to runoff, and at the same time increase the infiltration capacity of the soil under the forest to prevent water infiltration that is not conducive to infiltration. Soil compaction increases infiltration water and reduces runoff. In addition, the litter layer increases the roughness of the ground surface, which greatly reduces the runoff velocity. Therefore, appropriate plant measures can be taken according to the hydrology and soil conditions in the area where the channel is located. (3) From a mechanical point of view, when the trench's aspect ratio drops close to or quite close to the natural angle of repose, the bottom of the trench will no longer be undercut. Therefore, in order to prevent the channel undercutting and erosion, for the channel whose aspect ratio drop is greater than the natural angle of repose, relevant measures can be taken to reduce the channel aspect ratio drop and weaken the channel undercutting effect. For trenches with a longitudinal drop less than the natural angle of repose, the undercutting erosion stops and the hazard is weakened. Consider reducing or omitting the treatment measures to prevent undercutting at the bottom of the trench to save manpower, material resources and financial resources.

3. Establish and improve the erosion channel prevention system

Establish demonstration areas in key areas of erosion gully prevention and control, and carry out research on the optimal allocation of gully prevention and control measures. By combining specific control measures in the demonstration area, studying the benefits of optimized allocation of gully control measures on agricultural production, farmers' income, ecological environment, etc., a relatively complete erosion gully prevention and benefit evaluation system has been established to provide erosion gullies in loess hilly areas. Road prevention and control model trials, demonstrations, and promotion provide a reference for the entity model.

4. Erosion channel information management

With the development of society, the continuous development and maturity of computer technology, space technology and 3S technology have provided new ways for the information management of the erosion channel. Based on geographic information system, integrating 3S technology, and combining with computer network, establish a multi-level and comprehensive erosion gully information database in the loess hilly area of Henan Province to comprehensively manage the erosion gully information of river basins and various administrative regions To realize the functions of storage management, update, information query and application of erosion channel data is a necessary means and way to realize the information management of erosion channel.

5. Optimize the allocation of measures and focus on the overall benefits

In the preliminary work of small watershed management, Yinan County, in accordance with the principles of water and soil conservation work, closely focused on the theme of "protecting and rationally using water and soil resources, improving the ecological environment, and promoting economic development", and organized technical personnel to conduct investigations in small watersheds. The layout and quantity of various measures were refined to the hilltop land, and a detailed soil erosion control plan was formulated in conjunction with the local urban and rural development plan and agricultural development plan. In the planning concept, each small watershed

is regarded as a complete water and soil erosion control unit, focusing on the organic cooperation of various measures, and at the same time as an economic development unit, exerting the overall function of the small watershed ecosystem to achieve "a watershed management", The purpose of developing the economy of one side and enriching the people on the other side. Combining artificial management with natural ecological restoration, focusing on the economicalization of ecological benefits; combining management measures with management and protection mechanisms to extend the life of the project; combining ditch and slope management to change the temporal and spatial distribution of water resources and promote the comprehensive regulation of water resources And rational utilization; combining slope drainage with water storage, in-situ interception improves water resource utilization efficiency, achieves flood discharge and drought energy irrigation, and promotes the sustainable use of water and soil resources and the healthy development of watershed ecosystems.

6. An example of optimized configuration of trench-slope treatment project

Yinan County is located in the hinterland of the Yimeng Mountains. The territory is dominated by mountainous areas and hills. The vegetation coverage is low, coupled with years of agricultural production and development, there are more sloping fields, resulting in serious expansion of gullies and banks, with an average soil erosion modulus of 3100t/(km2• a) The soil erosion area accounts for 73% of the county's total area. For many years, the Yinan County Party Committee and the county government have attached great importance to water and soil conservation and ecological construction, and actively carried out comprehensive management of water and soil conservation with small watersheds as a unit, which promoted the sustainable use of water and soil resources, and improved the rural living environment and agricultural production conditions. Yinan County promotes domestic demand, water and soil conservation, and small watershed governance. The goal is to achieve sustainable utilization of water and soil resources, combined with the construction of a new socialist countryside, and based on the fundamental interests of the masses, through strengthening leadership, overall planning, multi-party fund-raising, and optimal allocation of measures It has achieved significant economic, ecological, and social benefits, promoted the harmonious coexistence of man and nature and the sustainable development of the regional economy, provided a model for the governance and development of local small watersheds, and created a standard project management, ecological and ecological development. The way of economic coordination, governance and development. And combined with tourism development and new rural construction, in the layout of governance measures, focus on the organic cooperation between individual measures to give play to the overall function of the small watershed ecosystem. By concentrating funds to improve construction standards, optimizing allocation and strengthening demonstrations, it provides a technical model for the governance of other small watersheds in the local area, and has accumulated rich experience in the construction and management of soil and water conservation projects in the new era, and effectively promoted the scientific management of local soil erosion.

The loess hilly area in Henan Province is the main dry farming area in the western part of Henan Province, and it is also one of the most serious soil erosion areas in Henan Province. The terrain in the area is complex, the soil is deep and loose, and the erosion resistance is weak. The erosion forms such as surface erosion, gully erosion, avalanches, and landslides sometimes occur and occur concurrently; Undercutting, ditch bank expansion, and ditch head tracing erosion continue to erode and divide the slope surface, so that the beam or plateau surface is cut to pieces. The resulting water and soil loss accounts for more than 60% of the total erosion in the loess hilly area. It has caused great harm to the production, life and ecological environment of the people in the mountainous areas of the region. At the same time, it has also seriously affected the agricultural production and food security of the region. The prevention and control of erosion gullies in the loess hilly region of western Henan has a long way to go. In view of the actual situation of the region, the pilot area was selected to carry out research on the optimal allocation of erosion gully prevention measures, and water and soil conservation engineering measures, biological measures, and water storage and soil conservation

farming measures were carried out from the perspectives of hydrology, ecology, and mechanics. And establish a full erosion gully control system, establish demonstration areas in key areas of erosion gully control, and carry out research on the optimal allocation of gully control measures. Pay attention to the information management of erosion gully, based on geographic information system, integrate 3S technology, and combine with computer network to establish a multi-level and comprehensive erosion gully information database in the loess hilly area of Henan Province, which will provide information on river basins and various administrative regions. Comprehensive management of erosion channel information to realize functions such as storage management, update, information query and application of erosion channel data. In order to further improve the technical level and benefits of erosion channel prevention and control, it plays an extremely important role in the construction of the ecological environment in Henan Province.

7. The scientific problem

In response to the needs of trench-slope treatment projects in the loess hilly and gully area, such as gully improvement, slope conversion to terraces, silt dams, and slope protection, the overall layout, structural design and structural design of typical drainage channels and slope treatment projects Optimize the plan, carry out the construction organization design of the safe and efficient trench-slope treatment project, develop safe and efficient supporting construction technology, and propose the planning, design and construction technology of the trench-slope treatment project; according to the regional characteristics and ecological management needs, In typical counties, optimize the configuration of gully-slope treatment engineering composite technologies such as gully control and land rebuilding, dam system construction, slope conversion to terraces, and establish county test demonstration bases; study the implementation principles of gully and slope treatment projects, and optimize planning Design standards, project scale and layout, construction technology and process, analyze the technical and economic benefits of gully-slope treatment, and put forward the principles and schemes for the optimization of gully and slope treatment projects in the loess hilly and gully area.

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