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Abstracts

Semantic Segmentation and Area Calculation of Water Storage Surface of Check Dams in Remote Sensing Images Based on Deep Learning ····· LIANG Jialong[1,2], LI Peng[1,2], WANG Tian[1,2], et al.
(1. State Key Laboratory of Ecological Environment of Water Engineering in Arid Regions, Xi'an University of Technology, Xi'an, Shaanxi 710048, China; 2. Key Laboratory of National Forestry and Grassland Administration on Ecological Hydrology and Disaster Prevention and Control in Arid Regions, Xi'an University of Technology, Xi'an, Shaanxi 710048, China) (14)

Enabling check dams for farmland forming to serve multiple functions such as irrigation and water supply while ensuring flood control safety can improve the utilization efficiency of stormwater resources and solve production and domestic water issues in the Loess Plateau region. Therefore, dynamic monitoring of the water storage status of check dams for farmland forming is crucial. Taking Jingbian County in the Loess Plateau as an example, the study used deep learning-based U-Net model to analyze semantic segmentation of water storage surfaces of check dams for farmland forming using high-resolution remote sensing images, explored the optimal input parameters and dataset for the model, and calculated the area of water storage surfaces using the Python programming tool, which were compared with the area manually delineated and calculated using ArcGIS software. The results show that: a) the model achieved the highest accuracy with an input size of 416 pixels×416 pixels, Batch size=4, and Dataset-2, with the accuracy rate, precision rate, recall rate, F1-Score, and average intersection overunion reaching 94.11%, 93.32%, 95.32%, 93.31%, and 91.71%, respectively; b) Dataset-2 contained only labels from the third quarter, with added labels from the second quarter reducing the segmentation accuracy; c) the number of water storage surfaces in Jingbian County's check dams for farmland forming identified by the U-Net model for the third quarter of 2021 and 2022 matched those obtained from manual interpretation, with the water storage surface area error being below 3%; d) this method is suitable for check dams with regular shapes, small water storage surface areas, simple backgrounds, and high distinctiveness, achieving the error of water storage surfaces area within 10% for individual dams and yielding good identification results, conversely, irregular shapes, large water storage surface areas, complex backgrounds, and low distinctiveness can reduce the model's identification capability.

Key Words: check dams for farmland forming; water storage surfaces; deep learning; U-Net model; Jingbian County

Growth Characteristics of Introduced Planting of Five Excellent Forage Grasses for Soil and Water Conservation in the Hilly and Gully Region of the Loess Plateau ····· RU Haili, DOU Qiaoli, JIN Xueqin
(Pingliang Soil and Water Conservation Science Research Institute, Pingliang, Gansu 744000, China) (38)

To provide the scientific basis for the introduction and promotion of excellent plant varieties for soil and water conservation and ecological farming in the Longdong hilly and gully region of the Loess Plateau, five species of Poaceae plants—*Pennisetum giganteum*, *Pennisetum purpureum* Schumab cv. Red, *Sorghum bicolor* × *sudanense*, *Sorghum bicolor* 'Dochna', *Zea mays*—were introduced and planted on the outlet dam land of the Zhifanggou small watershed in Pingliang City. A comparative analysis was conducted on their growth characteristics, phenological performance, adaptability, and forage yield. The results show that: a) under the same field management conditions, *Pennisetum giganteum*, *Pennisetum purpureum* Schumab cv. Red had later phenological stages except for the tillering stage, but longer growth periods; b) the tillering ability of the five plants ranked as follows: *Pennisetum giganteum* > *Pennisetum purpureum* Schumab cv. Red > *Sorghum bicolor* × *sudanense* > *Sorghum bicolor* 'Dochna' > *Zea mays*, at the end of the growth period, the average plant height and forage yield were in the order: *Pennisetum giganteum* > *Sorghum bicolor* × *sudanense* > *Sorghum bicolor* 'Dochna' > *Pennisetum purpureum* Schumab cv. Red > *Zea mays*; c) under non-optimal water and fertilizer conditions, all five species grew relatively well in this area and can be promoted as excellent plant varieties for soil and water conservation and ecological farming in the Pingliang area.

Key Words: excellent forage grass; growth characteristics; soil and water conservation; Zhifanggou small watershed; hilly and gully region of the Loess Plateau

Soil Erosion and Water Loss Monitoring and Prevention and Control Countermeasures for the Nierji Reservoir in the Nenjiang River Basin ····· JIA Changqing, BAI Jianhong
(Nenjiang Nierji Water Resources and Hydropower Co., Ltd., Qiqihar, Heilongjiang 161005, China) (80)

The Nierji Reservoir is located in the middle and upper reaches of the Nenjiang River at the border between Heilongjiang Province and the Inner Mongolia Autonomous Region in the high-altitude and cold region of Northeast China. It lies in the transitional zone between the hilly area on the eastern piedmont of the Greater Khingan Mountains and the Songnen Plain. The reservoir area covers 522.03 km^2, with a land area of 112.35 km^2. To scientifically and reasonably assess soil erosion and water loss in the reservoir area, the study established 50 check points across five monitoring zones, including farmland, forest land, grassland, bare land, and erosion gullies, with the monitoring period being a civil year of 2023. The results show that: a) the area of soil erosion and water loss in the reservoir region was 49.98 km^2, accounting for 44.49% of the land area, with 97.72% of the soil erosion and water loss distributed in farmland in 2023; b) erosion gullies in the reservoir area were mainly located in farmland, 69 erosion gullies with a total length of 10.73 km and an area of 7.5 hm^2, and the area of soil erosion and water loss in these gullies is 0.08 km^2, all classified as extremely severe erosion; c) the average soil erosion modulus for the entire reservoir area is 55 $t/(km^2 \cdot a)$, while the average soil erosion modulus for the soil erosion and water loss areas is 579 $t/(km^2 \cdot a)$, and the overall ecological environment of the reservoir area is in a relatively good state; d) future efforts should focus on strengthening soil erosion and water loss monitoring and early warning in the reservoir area, enhancing soil erosion and water loss control in the reservoir area and promoting regional collaborative control to ensure the sustainable development of the ecological functions of the reservoir.

Key Words: soil erosion and water loss; monitoring; prevention and control measures; Nierji reservoir; Nenjiang river