

## 水土保持林草措施碳汇效应研究进展

张杰铭<sup>1</sup> 王阳阳<sup>2</sup> 侯贵荣<sup>3\*</sup>

(1.南京水利科学研究院水文水资源与水利工程科学国家重点实验室, 南京 210029; 2.北京林业大学水土保持学院, 北京 100083; 3.四川农业大学林学院, 成都 611130)

**摘要:**明确水土保持林草措施碳汇效应,为进一步制定固碳增汇的政策措施和开展相关研究,全面提升水土保持碳汇能力,科学推进水土流失综合治理高质量发展提供借鉴。参考和借鉴国内外相关研究成果,综述水土保持林草措施碳汇意义、内涵和机理及计算方法,并分析了水土保持林草措施固碳增汇效果,提出了水土保持林草措施固碳增汇对策建议。水土保持林草措施碳汇效益显著,碳密度总体表征为乔木>灌木>草地>坡耕地,不同植被组分碳密度和不同土层土壤有机碳密度随恢复时间的延长总体上表现出增加的趋势。水土保持林草措施碳固存效率与措施实施年限、植物物种选择、植物群落结构、植物生长环境等多种因素有关。为了实现更大程度的水土保持固碳增汇,需要在水土保持碳汇监测标准化、措施营造经营和碳汇设计上寻求新的突破,推动生态系统提质增效,持续挖掘水土保持碳汇增长的潜力,提升和巩固碳汇能力。

**关键词:**水土保持; 碳汇; 林草措施

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**第一作者:**张杰铭,男,博士,工程师。主要研究方向:土壤侵蚀与水土保持。E-mail: jmzhang@nhri.cn

**通讯作者:**侯贵荣,男,博士,讲师。主要研究方向:森林水文与植被恢复。E-mail: hgralex@163.com

## Progress of research on the carbon sink effect of soil and water conservation forestry and grassland measures

Zhang Jieming<sup>1</sup> Jin Qiu<sup>1</sup> Xu Chun<sup>1</sup> Zhao Qinwen<sup>1</sup> Wang Yangyang<sup>2</sup> Hou Guirong<sup>3\*</sup>

(1.State Key Laboratory of Hydrology, Water Resources and Hydraulic Engineering Science, Nanjing Institute of Water Resources Science, Nanjing 210029, China; 2.School of Soil and Water Conservation, Beijing Forestry University, Beijing 100083, China;3.College of Forestry, Sichuan Agricultural University, Chengdu 611130, China)

**Abstract:** Clarifying the carbon sink effect of soil and water conservation forestry and grassland measures, so as to further develop the policy measures of carbon sequestration and sink enhancement and carry out relevant research, comprehensively enhance the carbon sequestration and sink enhancement capacity of soil and water conservation forestry and grassland measures, and scientifically push forward the high-quality development of comprehensive soil and water erosion management to provide a reference. Referring to and drawing on relevant research results at home and abroad, it summarises the significance, connotation, mechanism and calculation methods of carbon sinks of soil and water conservation forestry and grassland measures, analyses the effect of carbon sequestration of soil and water conservation forestry and grassland measures, and puts forward countermeasures and suggestions for sequestration of carbon sinks of soil and water conservation forestry and grassland measures. Carbon sink of forest and grassland measures for soil and water conservation refers to the process or ability to make use of the carbon storage function of forests and grasslands to increase the ground cover, improve water regulation and water and soil conservation, promote the absorption and fixation of atmospheric carbon dioxide by forest and grassland plants, improve the carbon sequestration capacity of forest and grassland soils, and reduce the loss of the soil carbon pool caused by soil erosion by adopting measures such as afforestation, planting of grasses and strengthening of the forest and grassland operation management, that is, through the biological, physical and chemical processes of absorption, assimilation and mineralisation. That is to say, through absorption, assimilation, mineralisation and other biological, physical and chemical processes, the formation of biomass, dead and dying matter, soil carbon, water carbon and other carbon sink products, continuously reduce the atmospheric carbon dioxide content and slow down the growth rate of the carbon dioxide concentration, so as to achieve the purpose of regulating the atmospheric carbon dioxide concentration, improving the organic carbon content of the soil as well as regulating the water and conserving water and conserving the soil and other purposes of sequestering organic carbon. Soil and water conservation forestry and grassland measures mainly include afforestation, grass planting, closed control, etc., and their carbon sinks are mainly manifested in three aspects: vegetation carbon sinks of soil and water conservation forestry and grassland measures, soil carbon sinks of soil and water conservation forestry and grassland measures, and soil conservation and grassland measures, and soil and water conservation and grassland measures. The calculation methods of forest and grass carbon sinks in the carbon sink calculation method of soil and water conservation forestry and grassland measures mainly include the biomass method, carbon sequestration coefficient method, accumulation method and biomass conversion factor method, etc., while the calculation methods of soil carbon sinks in the carbon sink calculation method of soil and water conservation forestry and grassland measures include the soil organic matter mass ratio method, the soil organic carbon density method and so on. The study showed that community cover, Margalef index, Shannon-Wiener index, aboveground biomass, root biomass and litter accumulation had significant effects on ecosystem carbon density; the soil carbon sequestration rate of grasses was higher than that of trees and shrubs, and was more pronounced in

the soil layer of 0-20 cm; the distribution of soil organic carbon with soil depth in the soil of 0-200 cm In 0-200 cm soil, the distribution of soil organic carbon with soil depth could be described by an exponential model; the relationship between soil carbon sinks and water content has an important application value, and when the organic carbon accumulation exceeded 30 Mg/ha, the water content of the soil decreased to less than 6%, which is close to the wilting coefficient of the local soil. Soil and water conservation forest and grassland measures aboveground part, underground root system and litter carbon density overall characterised as trees>shrubs>grassland; carbon density of different vegetation components and soil organic carbon density of different soil layers with the prolongation of the restoration time in general showed an increasing trend; the net carbon sinks of each carbon layer and the growth of the forest trees in each carbon layer are closely related, when the growth of the forest trees to a certain extent, the biomass is gradually maintained to a constant level, and the net carbon sinks of its annual tend to be stabilised; in practice, it is necessary to maintain the soil carbon pools at a certain level or below through appropriate artificial disturbances, such as controlling the community's density and other means, in order to contribute to the carbon and water balance of the soil within the forest.

**Keywords:** Soil and water conservation; carbon sink; forestry and grassland measures