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《中国工程院战略咨询项目信息参考》是中国工程科技知识中心提供的一项信息推送服务，该服务组织专业团队，基于中国工程科技知识中心地理资源与生态专业分中心在工程科技领域积累的数据资源，面向战略咨询研究项目需求提供信息的搜集、整理、加工、推送服务。

该信息参考面向院士专家开放订阅，每两周一期，欢迎订阅。



本刊主编：杨雅萍

本期编辑：陈晓娜 徐洋

电子邮箱：geockcest@igsnr.ac.cn

电话：64888145

通信地址：100088 北京 8068 信箱，北京市西城区冰窖口胡同 2

【文献速递】

1. 农牧交错带生态与生产用地时空转换及其驱动因素分析——以张家口坝上地区为例

作者：秦彦杰，武爱彬，赵艳霞，唐守普，刘欣，沈会涛，张胜海

文献源：干旱区研究，2023

摘要：为实现农牧交错带生态用地与生产用地的协调发展，提升区域生态功能，以张家口坝上地区为例，构建土地利用转移矩阵，利用地理集中度和地理探测器模型，揭示生态用地与生产用地时空变化、转换特征和驱动因素。结果表明：(1)2000—2020年，张家口坝上地区生态用地规模增加了5.41%，表现为先增后减的变化趋势，生产用地规模减少了6.89%，表现为先减后增的变化趋势。(2)生态用地和生产用地之间相互转换频繁，生产用地向生态用地转换了 21.23×10^4 hm²，转换数量逐渐减少，自然条件较好地区(降雨量多、海拔低和坡度缓等)的生产用地开始向生态用地转换；生态用地向生产用地转换了 12.47×10^4 hm²，转换数量逐渐增加，且自然条件较恶劣地区的生态用地开始向生产用地转变。(3)土壤有机质、人均耕地面积和坡度等是影响生产用地向生态用地转换的主要因素，土壤有机质与人均耕地面积的交互作用解释力最大；土壤有机质含量低、人均耕地面积多、坡度 $6^\circ \sim 15^\circ$ 和年均降雨量低于400 mm的地区容易发生生产用地向生态用地转变。坡度、年均降雨量和人均耕地面积等是影响生态用地向生产用地转变的主要因素，坡度与地貌类型的交互作用解释力最大；在坡度 $2^\circ \sim 6^\circ$ 较缓区、年均降雨量大于400 mm、人均耕地面积少的地区容易发生生态用地向生产用地转变。研究区近年来出现生态用地向生产用地的转换应引起重视。

2. 中国北方农牧交错带土地沙化区典型植物的雨季水分来源

作者：黄鹏，周爱国，马传明，刘左，张泽琛，白耀楠

文献源：地质科技通报，2023

摘要：中国北方农牧交错带是中东部地区重要的生态安全屏障，由于其系统结构脆弱、生态环境问题多发、土地沙化严重，开展生态修复工作显得十分重要。植物-土壤水分关系作为土地沙化区生态水文过程的重要组成部分，研究二者的

转化过程对于了解植物吸水模式、确定生态修复的首选植物种非常关键。以河北省张家口市康保县北部为例，基于雨季的大气降水、地下水、土壤水和植物水的氢氧同位素特征，分析了主要植物的吸水层位、生态位宽度和水分竞争关系。结果表明，柠条以吸收 80~100 cm 深度土壤水为主，吸水比例最大可达 87.7%，油菜花以吸收 0~20 cm 深度土壤水为主，吸水比例最大可达 82.3%，狼针的吸水层位与土壤含水率有关，在含水率较高的深度吸水比例更大，栉叶蒿的吸水深度较为均衡，各植物种的生态位宽度均较大，但部分植物间存在较强的水分竞争关系。本研究为中国北方农牧交错带土地沙化区的植物水源来源识别和生态修复提供了科学依据。

3. 基于能值生态足迹模型的北方农牧交错带定西市生态安全评价

作者：陆燕花，闫丽娟，李广，马维伟，梁赟亮

文献源：干旱地区农业研究，2023

摘要：为分析北方农牧交错带的生态安全问题，以北方农牧交错带典型代表区域定西市作为研究对象，运用能值生态足迹模型对该区域的生态安全状况进行了长时间序列研究。研究发现：1995—2019 年间定西市人均能值生态承载力从 0.61 hm²·人⁻¹ 增加到 0.75 hm²·人⁻¹，人均能值生态足迹从 1.22 hm²·人⁻¹ 增加到 1.60 hm²·人⁻¹。从人均能值生态足迹的构成组分来看，耕地人均能值生态足迹对定西市人均能值生态足迹的贡献最大，其次是草地人均能值生态足迹。25 年间，定西市始终处于生态赤字状态，万元 GDP 生态足迹从 11.92 hm²·万元⁻¹ 下降到 1.09 hm²·万元⁻¹，生态足迹多样性指数由 0.92 变化到 1.44，生态协调系数从 1.34 变化到 1.33，生态压力指数由 2.01 上升到 2.15，发展能力指数由 1.12 变化到 2.32，生态安全等级在危险和不安全之间变化，生态安全问题亟待解决。

4. Impacts of the world's largest afforestation program (Three-North Afforestation Program) on desertification control in sandy land of China

作者：Ke Qi, Icon, Jiaojun Zhu, Icon, Xiao Zheng, Icon, G. Geoff Wang, Icon & Mingcai Li

文献源：GIScience & Remote Sensing, 2023

摘要: In order to control the desertification, large-scale afforestation programs have been attempted worldwide. Among them, China initiated the world's largest afforestation program, Three-North Afforestation Program (TNAP, 1978–2050), in which the afforestation in sandy land has been questioned during the first 40 years. In fact, the contribution of the TNAP to vegetation establishment and its effectiveness in desertification control still remain unclear, which limited the further construction of the program. To answer the questions, we detected the dynamics of vegetation distribution (forest, shrubland, and grassland) and desertification status (slight, moderate, severe, and extremely severe) during 1978–2017 in the sandy land (45.5 million ha), by visual interpretation of 5-period remote sensing images with validation based on 3,100 sample plots from field surveys and 15,175 sample plots from the National Forest Resource Inventory. Vegetation degradation was identified by analysis combining the trends of net primary productivity and precipitation use efficiency. By Geographical Detector model, the driving forces of vegetation degradation (climate change, human activities, vegetation type, and sandy land type) were ranked and the contributions of the influential factors (climate change, human activities, and vegetation dynamics) to desertification changes were estimated. The results showed that for the 40 years, vegetation coverage increased by 0.5%, with increasing 113.8% and 338.8% of forest and shrubland, but decreasing 9.0% of grassland. Desertification area had little change while the overall intensity decreased. The TNAP contributed to desertification dynamics by 10.3%, which is lower than expected. Vegetation type was the dominant factor of vegetation degradation in general. Forest is less suitable for afforestation in sandy land than shrubland and grassland because of its lower stand establishment rate, higher degradation rate, and less contribution to desertification control. Thus, adjusting vegetation type to match local conditions (e.g., use shrub-land, grassland, and native species) and improving the vegetation resistance (e.g., transform monoculture forests into mixed forests, and make proper proportion for forest, shrubland, and grassland) was suggested. Our study provided specific and feasible strategies for further planning and implementation of TNAP, and references for vegetation restoration of sandy lands worldwide.

5. Climate plays a dominant role over land management in governing soil carbon dynamics in North Western Himalayas

作者: OwaisAli Wani, Vikas Sharma, Shamal S. Kumar

文献源: Journal of Environmental Management, 2023

摘要: The soil carbon (C) dynamics is strongly influenced by climate and land-use patterns in the Himalayas. Therefore, soils under five prominent land use [e.g., maize (*Zea mays*), horticulture, natural forest, grassland, and wasteland] were sampled down up to 30 cm depth under two climatic conditions viz., temperate and subtropical to assess the impacts of climate and landuse on soil C dynamics. Results demonstrated that irrespective of land use, temperate soil contains 30.66% higher C than subtropical soils. Temperate soils under natural forests had the higher total organic carbon (TOC, 21.90 g kg⁻¹), Walkley-Black carbon (WBC, 16.42 g kg⁻¹), contents, and stocks (TOC, 66.92 Mg ha⁻¹ and WBC, 50.24 Mg ha⁻¹), and total soil organic matter (TSOM, 3.78%) concentration as compared to other land uses like maize, horticulture, grassland, and wasteland. Under both climatic conditions, maize land use had the lowest TOC 9.63, 6.55 g kg⁻¹ and WBC 7.22, 4.91 g kg⁻¹ at 0–15 and 15–30 cm soil depth, respectively. Horticulture land use had 62.58 and 62.61% higher TOC and WBC over maize-based land use under subtropical and temperate climatic conditions at 0–30 cm soil depth, respectively. However, soils of maize land use under temperate conditions had ~2 times more TOC than in subtropical conditions. The study inferred that the C-losses is more in the subtropical soil than in temperate soils. Hence, the subtropical region needs more rigorous adoption of C conservation farming practices than the temperate climatic setting. Although, the adoption of C storing and conserving practices is crucial under both climatic settings to arrest land degradation. Horticultural land uses along with conservation effective soil management practices may be encouraged to restore more soil C and to improve the livelihood security of the hill populace in the North Western Himalayas.

6. Evaluation of the effects of long-term natural and artificial restoration on

vegetation characteristics, soil properties and their coupling coordinations.

作者:

Lanqian Feng, , Mingming Guo, , Wenlong Wang, , Qianhua Shi, , Wenzhao Guo
, , Yibao Lou, , Yanan Zhu, , Hao Yang, , Yiyuan Xu

文献源: Science of The Total Environment, 2023

摘要: Vegetation restoration is the most important factor to restrain soil and water loss in the Chinese Loess Plateau, and its effect is long-term. Among them, the coupling and coordination relationship between vegetation and soil is the key to the smooth implementation of ecological restoration and the project of returning farmland to forest and grassland. However, people have neglected whether the choice of vegetation restoration method is suitable for the development of ecological environment in this region, and whether vegetation and soil coexist harmoniously. In this paper, the typical watersheds with similar terrain environment but different vegetation restoration methods were selected as the research objects, which were Dongzhuanggou (natural restoration, NR) and Yangjiagou (artificial restoration, AR). Through vegetation investigation and soil physical property experiment, the comprehensive evaluation function was used to quantify the impact of restoration methods on vegetation characteristics and soil properties, and the vegetation-soil coupling model was used to explore the coordinated development of vegetation and soil under different restoration methods. The results showed that there were significant differences between the two restoration methods in terms of vegetation characteristics ($P < 0.05$). The vegetation diversity indices of NR were 1.59–4.81 times that of AR. For root characteristic indices, NR was 1.05–2.25 times that of AR. For soil physical properties, there was no significant difference between the two restoration methods ($P > 0.05$). The comprehensive evaluation function of vegetation (VCE) and soil (SCE) under NR were 0.74 and 0.42, respectively, while those under AR were 0.55 and 0.63, respectively. The comprehensive function showed that the vegetation population performance under NR was slightly better than that under AR, while the soil restoration effect was opposite. Under the two restoration methods, the vegetation-soil coupling relationship was barely coordinated (NR: 0.53; AR: 0.54), and both were the intermediate coordinated

development mode. The vegetation diversity, tending level and soil management level should be improved simultaneously during the process of vegetation restoration on the Chinese Loess Plateau.

【科学数据】

1. 基于遥感反演的 1982–2015 年中国北方温带和青藏高原高寒草地地上生物量空间数据集

摘要：本研究以大量地面实测 AGB 数据为基础，借助长时间序列的归一化植被指数数据，构建了中国北方温带和青藏高原高寒草地 AGB 的遥感估算模型，对 1982–2015 年间逐年的 AGB 进行了估算，从而形成了 1982–2015 年中国北方温带和青藏高原高寒草地 AGB 的逐年空间数据集。通过数据公开和免费下载服务的方式，为中国草地生态系统动态变化的相关研究提供基础数据支持，也为我国草地的适应化管理提供科学依据。数据集包括 38 个文件，其中 34 个文件为中国北方温带和青藏高原高寒草地 1982–2015 年逐年的地上生物量空间数据，另外 4 个文件为 1980s（1982–1989 年），1990s（1990–1999 年），2000s（2000–2009 年）和 2010s（2010–2015 年）地上生物量的平均值。

链接：

<http://www.nesdc.org.cn/sdo/detail?id=5fa53685042ebb70d0c83407>

2. 青藏高原农业活动强度数据集（1980s-2015）

摘要：青藏高原农业活动强度数据集是基于县级农业统计数据，包括逐年耕地面积、农林牧渔劳动力、农机总动力、农村用电量、有效灌溉面积、农药使用量、化肥使用量、粮食作物总产量、农林牧渔生产总值，构建以农业投入指数和产出指数为一级指标，单位耕地面积农机总动力、单位耕地面积化肥施用量、劳动生产率等 10 个指标为二级指标的农业活动强度指标体系。利用熵值法确定各级指标权重，并通过层次分析法获得青藏高原县级农业投入和产出指数。基础数据来自国家统计局发布的统计数据，并对原始数据进行了核准与校正，具有较高可信度。数据集包括的 1980s-2015 年青藏高原县级投入产出指标和投入、产出指数一定程度上反映了青藏高原农业生产活动强度时空变化特征，为当地

农业发展提供数据支持和理论参考。

链接：

<https://data.tpdac.ac.cn/zh-hans/data/d23b9c05-0eb9-4e21-9c8b-56489af012b3>

本刊主编：杨雅萍

本期编辑：陈晓娜 徐洋

电子邮箱：geockcest@igsnr.ac.cn

电话：64888145

通信地址：100088 北京 8068 信箱，北京市西城区冰窖口胡同 2 号