Dear authors,

Thank you for responding to the feedback from both referees. The referees have given significant comments and suggestions that need to be incorporated into a revised version of the manuscript for further review consideration. Alongside addressing the referees' comments, please take into account the following comments for further review consideration.

General comment:

1. Line 143: “SP”, full name if it is the first-time usage.

Response: I revised it as ‘SP (Satellite Phenology)’.

2. Table 1: The last two sets of experiments seem to be confused, the author should revise the description. And, the temporal resolution of these experiments is not clear, more detailed information is needed here.

Response: I revised the table and context. The model outputs were configured with a temporal resolution of 3 h. (Line 140).

This expression is kept consistent in the paper as follows:

Finally, additional sensitivity simulations were conducted in which specific biogeophysical parameters were altered while other settings remained the same as those in the Yanchi_grass simulation. In the Yanchi_laisai simulation, the leaf and stem area index (LAI + SAI) of grasslands was replaced by LAI + SAI of cropland. Similarly, in the Yanchi_height simulation, the vegetation height of grasslands was substituted with the vegetation height of cropland (Breil et al., 2020). These sensitivity experiments aimed to explore the influence of biogeophysical factors in regulating energy and vapour fluxes during LUCC. (Line 154-158).

3. Why did you design the EXP2015? No analysis of this experiment was found in the manuscript.

Response: Thanks, I deleted it.

4. Line 315: The authors should provide more detailed descriptions about why the sum percentage of bare land and croplands is 34%, which is different from Line 314.

Response: These experiments assumed that land use conversions occur exclusively among barren land (29.9%), croplands (12.5%), and grasslands (52.0%), while other land use/cover classes (5.6%) were excluded from the transformation process. So, in the experiments, we set other land use/cover classes (~ 6%) not to change. The grassland is 60%, so the sum of bare land and croplands is 34%.

This expression is kept consistent in the paper as follows:

These experiments assumed that land use conversions occur exclusively among barren land (29.9%), croplands (12.5%), and grasslands (52.0%). While other land use/cover classes (5.6%), including shrublands, urban areas, water bodies, and forests, remained constant and were excluded from the transformation process. Two extreme scenarios were defined: in EXP_603004, *additional grassland is converted entirely from croplands, resulting in a land use/cover composition of 60% grassland, 30% bare land, and 4% croplands; in EXP_602113, grassland expansion occurs through the conversion of bare land, resulting in a composition of 60% grassland, 21% bare land, and 13% croplands. Additionally, three intermediate scenarios were designed with incremental variations in the proportions of bare land and croplands: 60%, 23%, and 11% in EXP_602311; 60%, 25%, and 9% in EXP_602509; 60%, 27%, and 7% in EXP_602707. (Line 288-295)*

5. Line 318: As shown in Table 1, these experiments were conducted under the dynamic climatic forcing, not "static climatic forcing".

Response: I delete 'static climatic forcing'. We conducted experiments under the dynamic climatic forcing. I review previous studies with similar simulations. A couple study expressed as express as 'assuming fixed oceanic conditions'(Davin and De Noblet-Ducoudré, 2010) or 'keeping the atmospheric forcing field constant' (Wang et al., 2020). While some studies only explain LUCC experimental design with different land use/cover and the same simulation period. They don't emphasize that the climatic forcing doesn't change (Breil et al., 2020; Cherubini et al., 2018). I revised the experiment in the paper as follows:

A suite of land use/cover scenarios experiments were designed to explore the impacts of LUCC. The only difference among the land use/cover scenario experiments was the land use/cover class, ensuring that the impacts of LUCC were isolated. The impacts of LUCC from 2000 to 2015 were quantified by comparing EXP2000 and CN2015 (Wang et al., 2020; Breil et al., 2020). Three additional experiments examined the effect of individual LUCC: EXP_bare and EXP_crop scenarios respectively extended bare land and croplands to 100%, respectively, while EXP_grass set grasslands to 100%, replacing bare land and croplands (Cherubini et al., 2018). To evaluate vegetation restoration in the APENWC, future land use/cover scenarios were conducted by setting the percentage of grasslands at 60% and varying proportions of croplands and bare land simulated in EXP_602113, EXP_602311, EXP_602509, EXP_602707, and EXP_603004 (Line 146-153)

General comment:

Why the optimal scenario was selected based on the minimum delta WC? (Table 2). Would an increase in WC be desirable in terms of sustainability? There are other scenarios that decrease ET while keeping the 60% target in grassland. A scenario of "minimum change" is not necessarily an optimal scenario. It depends on what is the main objective of the restoration project and the reference conditions these variations are computed from.

There are scenarios showing a slight warming (higher LST) and increases in water balance (higher WC), based on the arguments provided in the manuscript (copied below), the scenarios with higher WC should be selected. Please clarify:

"For sustainable ecological construction, it is necessary to pursue an alternative mixture of land use/cover without augmenting warming and endangering water availability. This means the proper mixture of land use/cover has a lower LST and larger WC than in 2015 (Arora and Montenegro, 2011; Bai et al., 2019; Wang et al., 2021d; Findell et al., 2017). Therefore, vegetation restoration strategies in the APENWC should use an appropriate mixture of land use/cover, such as EXP_602311; this indicates that approximately 6.9 % (5348 km2) of bare land and 1.5 % (1163 km2) of croplands transformed into grasslands. The LUCC to EXP_602311 generally caused more cooling and slightly increased the WC owing to proper vegetation restoration. Otherwise, other scenarios would lead to warming or drying, exacerbating drought in the APENWC."

Response: It's true that it's not proper to determine the optimal scenario. I will change my abstract/result/conclusion to be more academic.
Excessive vegetation restoration undermined soil drying in the APENWC. In this paper, I design future land use/cover scenarios by setting grassland coverage at 60% and varying the proportions of croplands and bare land in CLM5.0. These scenarios were evaluated to assess the potential impacts of future LUCC in the APENWC, emphasizing ecohydrological sustainability/water conservation. The results show that none of the scenarios showed significant adverse effects on WC, suggesting that vegetation restoration will not intensify drying conditions. These results indicate that increasing grassland coverage to 60% by 2035 supports ecohydrological sustainability without introducing drying.

This expression is kept consistent in the paper as follows:

Title: Expanding Grassland Coverage Maintain Ecohydrological Sustainability in the Agro-Pastoral Ecotone of Northwest China

Abstract:
To achieve ecological sustainability, the Chinese government is conducting large-scale vegetation restoration projects to increase grasslands to 60 % by 2035. However, excessive vegetation restoration undermined soil drying in the agro-pastoral ecotone of Northwest China …… It is unclear the potential impacts of future land use/cover change (LUCC) on ecohydrological sustainability over the APENWC. To fill this gap …… (The result:) *Future scenarios assuming 60 % grassland cover with varying proportions of bare land and cropland suggest that none of the scenarios showed significant adverse effects on WC, suggesting that vegetation restoration will not intensify drying conditions. These results indicate that increasing grassland coverage to 60% by 2035 supports ecohydrological sustainability without introducing drying.*

Introduction:
(The research gap:) Excessive vegetation restoration has been reported to undermine ecohydrological sustainability, leading to challenges such as soil drying (Jia et al., 2017b; Zhang et al., 2018). These findings highlight the urgent need for land use/cover configurations that balance vegetation restoration with ecohydrological sustainability in the APENWC. Additionally, the latest national ecological development plan, implemented from 2021 to 2035, aims to increase grassland coverage to 60 % and convert bare land and croplands into grasslands to enhance ecosystem services ((China state council, 2017; National developmen tand reform commission, 2019). However, this ambitious target has not been thoroughly assessed for its potential impacts on ecohydrological sustainability.

……

(What I do:) This study examined the impacts of historical and future LUCC associated with vegetation restoration projects in APENWC using the Community Land Model (version 5.0, CLM5.0). Section 2 …… Section 3.1 aanalysed the spatially averaged impacts of LUCC during the historical period of 2000–2015 under a realistic LUCC scenario. Additionally, the individual impacts of different LUCC types were quantified using idealised scenarios where specific LUCC types are maximised. Section 3.2.1 categorized the historical land use/cover composition from 2000 to 2015 and attributed the spatially averaged impacts to the synergistic effects of multiple LUCC types. Finally, Section 3.2.2 introduced future LUCC scenarios designed to achieve the government's target of 60 % grassland coverage. These scenarios were evaluated to assess their potential effects on water conservation (WC) in the APENWC. Section 4 …… Section 5 ……

Result:

The simulations of future land use/cover scenarios, compared with 2015 are presented in Table 2. Grassland expansion through the conversion of croplands (EXP_603004) resulted in significant variations in LST (0.09 ℃) and ET (-17.62 mm yr-1). Achieving the target of increasing grassland coverage to 60 % by 2035, primarily through cropland-to-grassland conversions, would increase ET in the futur. However, none of the scenarios had a significant negative impact on WC, indicating that the vegetation restoration efforts are unlikely to exacerbate drying. These findings suggest that increasing grassland coverage to 60% by 2035 maintains ecohydrological stability while advancing vegetation restoration goals.

General writing of the manuscript: The response letter and revised manuscript have helped to better understand the methodological framework, results and conclusions; however, the English writing still requires an in-depth revision as some ideas are still unclear or misleading.

Response: Thanks. I revised the abstract following your suggestion and revised all the manuscripts by myself. Then the new manuscript has been edited to ensure language and grammar accuracy by professional editors at Editage. The editing certificate is as follows:

editage

Editing Certificate

This document certifies that the manuscript listed below has been edited to ensure language and grammar accuracy and is error free in these aspects. The edit was performed by professional editors at Editage, a brand of Cactus Communications. The author's core research ideas were not altered in any way during the editing process. The quality of the edit has been guaranteed, with the assumption that our suggested changes have been accepted and the text has not been further altered without the knowledge of our editors.

MANUSCRIPT TITLE

Optimizing Land Use/Cover Composition and Vegetation Restoration Strategies to Mitigate Drying and Warming for Ecohydrological Sustainability in Northwest China's Agro-Pastoral Ecotone

AUTHORS

Yuzuo Zhu

ISSUED ON

December 28, 2024

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THE EDITAGE Promise QUALITY GUARANTEE

Prabh Grewal
Senior Vice President - Editage

Minor comment: Revise grammatical error: APNEC appears several times. It should be APENWC.

Response: Thanks. I revised it.

Reference

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