Reviewer 1

We would like to thank you for your constructive and thoughtful comments. We have implemented all of your suggestions which have led to a much improved and complete manuscript. In the following sections, the issues raised by you are addressed in the order.

1. The effect of the accuracy of the adopted data on the conclusions should be discussed. For example, accuracy of land use data is 0.1°.

   Response: The land use dataset was produced in previous teamwork (Du et al, 2020). 500 samples were selected to evaluate land use data with field investigation and high-resolution images. The evaluation results show that the overall accuracy of the final classification and KAPPA coefficient are both >0.8, which meets the accuracy requirements. The precision of the land use dataset was trustworthy.

   This expression is kept consistent in the paper as follows (L128-L133):

   The surface land use/cover dataset that covered the study area was evaluated in a previous study and the precision was trustworthy (Du et al., 2020). The China meteorological forcing dataset and MODIS LST have been widely used including in the study area of previous work (Li, 2021; Wang et al., 2020). Other datasets like GLASS have been evaluated in the papers that produce the data. The uncertainty of soil properties is in the discussion Section 4.2.

   Du, T., Jiao, J., Duan, H., He, H., XUE, X., and Xie, Y.: Study of conversion between land use/landcover classification system of Chinese Academy of Science and IGBP classification system: In the northwest argo-pastoral zone Journal of Lanzhou University: Natural Science (in Chinese), 56, 91-95, https://doi.org/10.13885/j.issn.0455-2059.20120.01.011, 2020.

   Wang, X., Zhang, B., Xu, X., Tian, J., and He, C.: Regional water-energy cycle response to land use/cover change in the agro-pastoral ecotone, Northwest China, Journal of Hydrology, 580, 124246, https://doi.org/10.1016/j.jhydrol.2019.124246, 2020

   Li, F.: Assessment and fusion of the soil moisture data sets based on community land model and smap satellite (in Chinese), M.S. thesis, Lanzhou Univeristy, 16-40 pp., 2021.

2. Many sentences are very long. It is recommended to shorten them. For example line 45 and line 55.

   Response: Thank you. I shortened it and polished all the content in the paper.

   This expression in the paper is as follows (L43-L46):

Satellite products rarely provide accurate continuous long-term data because the satellite obtains instantaneous images, and processing methods introduce uncertainty (Srivastava et al., 2015; Zhang et al., 2010). Numerical models have been used to study multiple variables with high spatial resolution over extended periods and access flux cycles with a consistent framework (Han et al., 2021; Winckler et al., 2018).

3. in line 85. In the form of references.

Response: It is a web page. I revised it according to the example of Biogeosciences (shown in the picture).

- Webpages
  - Title
  - URL
  - Access date
  - Year (if not the same as access date)

Copernicus Publications: https://publications.copernicus.org/, last access: 25 October 2018.

This expression in the paper is as follows:

"Additionally, the latest national ecological development project plans to expand grasslands to 60 % in China and continue to convert bare and agricultural lands to grasslands to improve ecosystem services in the APNEC from 2021 to 2035 (China state council, 2017; National development and reform commission, 2019)." (L78)

"The aims of the government plan for 2035 are 1) the grasslands of 60 % and 2) the re-vegetation of bare land and croplands to grasslands (China state council, 2017; National development and reform commission, 2019)." (L309)

In reference:

Major projects for ecological protection and restoration support systems: http://gi.mnr.gov.cn/202006/t20200611_2525741.html, last access: 2024. (L463)

Notice of the state council on printing and distributing the outline of the national land plan (2016-2035): http://www.gov.cn/zhengce/content/2017-02/04/content_5165309.htm, last access: 2024. (L571)

4. The study area in this paper is not the whole of APENC. The specific location of the study area in the APENC should be introduced.

Response: The study area in this paper is the agro-pastoral ecotone of Northwest China (APNEWC). It is located in the Northwest of the agro-pastoral ecotone of Northern China (APNEC). So I changed and used APNEWC in ner version.

The boundary of agro-pastoral ecotone are only qualitative descriptions, and the specific distribution boundaries didn't reach an agreement because of the difference of the defined indicators from ecology, climatology, economic geography, and macrogeography. In our project, the agro-pastoral ecotone of Northwest China (APNEWC) was identified by previous research (Wang et al., 2020; Xu et al., 2022; Tan et al., 2020).

This expression is kept consistent in the paper as follows (L93-L97):

"The boundary of the agro-pastoral ecotone did not reach agreement because of the differently defined indicators of ecology, climatology, and economic geography (Li et al., 2021). The APENWC was identified based on previous research (Wang et al., 2020; Tan et al., 2020), including the Otog Banner, Otog Front Banner, Lingwu, Yanchi, Dingbian, Jingbian, Hengshan, Yuyang, Wushen, and Shenmu (Tan et al., 2020; Wang et al., 2021b). It is northwest of the agro-pastoral ecotone of Northern China (APENC)."

Wang, X., Zhang, B., Xu, X., Tian, J., and He, C.: Regional water-energy cycle response to land use/cover change in the agro-pastoral ecotone, Northwest China, Journal of Hydrology, 580, 124246, https://doi.org/10.1016/j.jhydrol.2019.124246, 2020.

Xu, X., Li, X., Wang, X., He, C., Tian, W., Tian, J., and Yang, L.: Estimating daily evapotranspiration in the agricultural-pastoral ecotone in Northwest China: A comparative analysis of the Complementary Relationship, WRF-CLM4.0, and WRF-Noah methods, Sci Total Environ, 729, 138635, https://doi.org/10.1016/j.scitotenv.2020.138635, 2020.

Tan, X., Zhang, L., He, C., Zhu, Y., Han, Z., and Li, X.: Applicability of cosmic-ray neutron sensor for measuring soil moisture at the agricultural-pastoral ecotone in northwest China, Science China Earth Sciences, 63, 1730-1744, https://doi.org/10.1007/s11430-020-9650-2, 2020.

5. The contents of Table 1 can be directly elaborated in paper (delete table 1)

Response: Thank you. I deleted the table.

6. Significance test can be added in Table 5 and Table 6.

Response: Thank you. I added the result of the significant test (Table S3 and Table S4).

Table S3 Relationships between differences in LST and ET and surface albedo, surface roughness, LAI+SAI, aerodynamic resistance, vegetation displacement height, leaf stomatal resistance, and vapor pressure, respectively, in the intense LUCC region (EXP_grss - EXP_crop). The * indicates statistical significance at the 95% confidence level, and ** indicates statistical significance at the 99% confidence level.

	Δ LST					Δ Latent heat flux/Δ ET				
	MAM	JJA	SON	DJF	year	MAM	JJA	SON	DJF	year
Δ surface	0.22	0.35	-0.07	-0.47	-0.18	0.01	-0.36	-0.10	-0.38	-0.12

albedo	**	**	**	**	**		**	**	**	**
Δ surface roughness	0.13 **	-0.19 **	-0.06 **	-0.07 **	0.01 *	-0.27 **	0.07 **	-0.27 **	0.21 **	-0.27 **
Δ LAI+SAI	-0.20 **	-0.19 **	-0.15 *	0.02	-0.21 **	0.33 **	0.07 **	0.30 **	0.24 **	0.38 **
Δ aerodynamic resistance	0.01	-0.04 **	-0.05 **	-0.33 **	-0.12 **	-0.03 *	-0.05 **	-0.05 **	-0.19 **	-0.04 **
Δ vegetation height	0.09 **	-0.22 **	-0.10 **	-0.03 *	-0.04 **	0.24 **	0.07 **	-0.21 **	0.06 **	-0.20 **
Δ leaf stomatal resistance	0.11 **	0.19 **	0.08 **	-0.03 *	0.10 **	-0.15 **	-0.11 **	0.17 **	0.07 **	-0.03 **

Table S4 Relationships between differences in LST and ET and surface albedo, surface roughness, and aerodynamic resistance, respectively, in the intense LUCC region (EXP_grass - EXP_bare). The ** indicates statistical significance at the 99% confidence level.

	Δ LST					Δ Latent heat flux/Δ ET				
	MAM	JJA	SON	DJF	year	MAM	JJA	SON	DJF	year
Δ surface albedo	0.01 **	0.33 **	-0.02 **	-0.30 **	-0.10 **	-0.14 **	-0.51 **	-0.08 **	-0.34 **	-0.18 **
Δ surface roughness	0.06 **	-0.22 **	-0.04 **	0.15 **	-0.05 **	-0.21 **	0.13 **	-0.27 **	0.38 **	-0.24 **
Δ aerodynamic resistance	-0.06 **	-0.08 **	0.01 **	-0.22 **	-0.08 **	-0.05 **	0.07 **	-0.01 **	-0.22 **	-0.01 **

7. in line 241. November is missing.

   Response: Thank you. I have corrected the mistake. This expression in the paper is as follows (L223):

   "-0.06 ± 0.14 ℃ in autumn (SON: September & October & November)."

8. The conclusion can take the form of paragraphs and should be condensed.

   Response: Thank you. I made the conclusion more condensed. This expression in the paper is as follows (L396-L409):

   "This study first simulated and quantified the effects of LUCC using CLM5.0, which was verified based on in-situ observations, in the agro-pastoral ecotone of northwest China. Subsequently, five LUCC scenarios were proposed and assessed to identify the optimal mixture of land use/cover in the study region. The main findings are as follows: First, bare land to grasslands reduced LST while croplands to grasslands increased LST. The bare land to grasslands caused an increase in ET whereas croplands to grasslands caused a

decrease in ET. This led to a spatially averaged cooling surface and increased ET from 2000 to 2015 over the study area. Second, an in-depth analysis of the LUCC pattern from 2000 to 2015 revealed that some grids showed warming or drying, whereas one grid showed both drying and warming. Different mixtures of LUCC could lead to different results for re-vegetation projects, which indicates the complicated synergistic effects of bare land and croplands to grasslands as re-vegetation. Finally, assessing the five proposed LUCC scenarios related to the Chinese government's long-term ecological plan by lowering LST and higher Wc, the proper mixture of LUCC in the APENWC in 2035 is approximately 60 % grasslands, 23 % bare land, and 11 % croplands respectively, which will mitigate the drying and warming surface environment. These findings provide useful information to support land management policy/decision-making in the study region."

Reviewer 2

The subject of the study and the development of the technical-scientific part is consistent and provides important land management data for a large area, using validated land use models. Also, the results are integrated with a Chinese government plan for land use restoration, providing useful information for policy development.

We would like to thank you for your constructive and thoughtful comments. We have implemented all of your suggestions which have led to a much improved and complete manuscript. In the following sections, the issues raised by you are addressed in the order.

1. However, there are several things that could be improved; it is a text that in many parts is redundant, for example between L 342 and 346 the same idea is expressed twice without sense, in the same page in L 367 the information presented in table 8 (percentages) is repeated and the SAME information is repeated again in lines 433 and 434.

   Response: Thank you.

   L342-346 was polished in the new version (L311-L313) as follows:

   "Thus, in 2035, different mixtures of land use/cover were simulated to pursue the proper mixture of land use/cover. First, we set the percentage of grasslands at 60 % by 2035. Then, the percentage of bare land and croplands, 13 and 30 % respectively, decreases in 2035 to meet the increase in grasslands and is set as the maximum in future scenarios."

   I deleted Table 8.

   L 433-434 was deleted.

2. The equations 1,2 y 3 are widely used and it´s not necessary to present them.

   Response: Thank you. I deleted it.

3. There is a lot of information (ten tables and fifteen figures!) I suggest reducing this by at least half (ideally less) and leaving some as supplementary material.

   Response: Thank you. I left 6 figures and 2 tables. I put others into the Supplementary Material. The change is:

Orginal version	New verison
Figure 1	Figure 1
Figure 2	Figure S1
Figure 3	Figure S2
Figure 4	Figure S3
Figure 5	Figure S4
Figure 6	Figure S5
Figure 7	Figure 2
Figure 8	Figure 3
Figure 9	Figure 4
Figure 10	Figure S6
Figure 11	Figure S7
Figure 12	Figure S8
Figure 13	Figure 5
Figure 14	Figure 6
Figure 15	Figure S9
Table 1	delete
Table 2	Table S1
Table 3	Table S2
Table 4	Table 1
Table 5	Table S3
Table 6	Table S4
Table 7	Table S5
Table 8	delete
Table 9	Table 2
Table 10	Table S6

4. The results are listed again in the conclusions, it is not necessary to repeat them, also the number 1 (L. 422 and 423) in conclusion Are these study results?.

   Response: Thank you. I polished it. This expression in the paper is as follows (L396-L408):

   "This study first simulated and quantified the effects of LUCC using CLM5.0, which was verified based on in-situ observations, in the agro-pastoral ecotone of northwest China. Subsequently, five LUCC scenarios were proposed and assessed to identify the optimal mixture of land use/cover in the study region. The main findings are as follows: First, bare land to grasslands reduced LST while croplands to grasslands increased LST. The bare land to grasslands caused an increase in ET whereas croplands to grasslands caused a decrease in ET. This led to a spatially averaged cooling surface and increased ET from 2000 to 2015 over

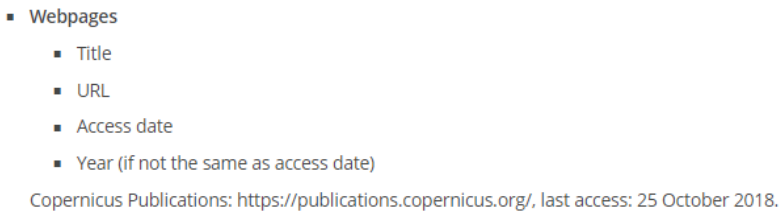
the study area. Second, an in-depth analysis of the LUCC pattern from 2000 to 2015 revealed that some grids showed warming or drying, whereas one grid showed both drying and warming. Different mixtures of LUCC could lead to different results for re-vegetation projects, which indicates the complicated synergistic effects of bare land and croplands to grasslands as re-vegetation. Finally, assessing the five proposed LUCC scenarios related to the Chinese government's long-term ecological plan by lowering LST and higher Wc, the proper mixture of LUCC in the APENWC in 2035 is approximately 60 % grasslands, 23 % bare land, and 11 % croplands respectively, which will mitigate the drying and warming surface environment. These findings provide useful information to support land management policy/decision-making in the study region."

5. The use of abbreviations is confusing, bareland, cropland, grassland and "BL", "CL", and "GRS" are used indistinctly.

   Response: Thank you. I deleted all abbreviations and use "bare land", "croplands", and "grasslands".

6. It´s not necesary to paste the URL of information in the text body (L. 85 and 86) and it´s repeated in L 340 and 341 redundant, the should be in the Reference.

   Response: It is a web page. I revised it according to the example of Biogeosciences (shown in the picture).



This expression in the paper is as follows:

"Additionally, the latest national ecological development project plans to expand grasslands to 60 % in China and continue to convert bare and agricultural lands to grasslands to improve ecosystem services in the APNEC from 2021 to 2035 (China state council, 2017; National development and reform commission, 2019)." (L78)

"The aims of the government plan for 2035 are 1) the grasslands of 60 % and 2) the re-vegetation of bare land and croplands to grasslands (China state council, 2017; National development and reform commission, 2019)." (L309)

In reference:

Major projects for ecological protection and restoration support systems: http://gi.mnr.gov.cn/202006/t20200611_2525741.html, last access: 2024. (L463)

Notice of the state council on printing and distributing the outline of the national land plan (2016-2035): http://www.gov.cn/zhengce/content/2017-02/04/content_5165309.htm, last access: 2017. (L570)

7. L. 100-101 the use of averaged instead of average

   Response: " I used “annual average” in L98, L99, L247.

8. The use of water conservation, defined in the water balance Eq 4. (L. 212), implies the use of runoff, it is not explained how this term is approached.

   Response: All terms are from the output of the model, including runoff, which was evaluated by section 2.4 and previous work (Deng et al, 2022; Li, 2021; Wang et al, 2019). This expression will be kept consistent in the paper as follows (L198-L199):

   “the other data are the outputs of CLM5.0, whose performance was validated by Li (2021) and the previous section.”

   Deng, M., Meng, X., Lu, Y., Shu, L., Li, Z., Zhao, L., Chen, H., Shang, L., Sheng, D., and Ao, X.: Impact of climatic and vegetation dynamic change on runoff over the Three Rivers Source Region based on the Community Land Model, Climate Dynamics, https://doi.org/10.1007/s00382-022-06619-0, 2022.

   Li, F.: Assessment and fusion of the soil moisture data sets based on community land model and smap satellite (in Chinese), M.S. thesis, Lanzhou Univeristy, 16-40 pp., 2021.

   Wang, H., Xiao, W., Zhao, Y., Wang, Y., Hou, B., Zhou, Y., Yang, H., Zhang, X., and Cui, H.: The Spatiotemporal Variability of Evapotranspiration and Its Response to Climate Change and Land Use/Land Cover Change in the Three Gorges Reservoir, Water, 11, 1739, https://doi.org/10.3390/w11091739, 2019.

9. In the line 381-382 a part is explained, in the discussion, which should be explained in the methodology

   Response: Thank you. I deleted it here and put this part into methodology (L160-164) as follows:

   “Additionally, two sensitivity experiments were conducted to examine the role of the biogeophysical characteristics of vegetation. The leaf and stem area index (LAI + SAI) of grasslands was replaced by crop in Yanchi_laisai and canopy height in Yanchi_height (Breil et al., 2020). Sensitivity experiments were conducted only at the most representative Yanchi station to save computation time.”

10. It is necessary for a english gramatical review, there are errors in the use of verbs e.g. L 100 "...with and annually averaged temperature..." should be "...with an annual average temperature" or L 346 a verb in the past tense is used to talk about 2035. The use of "Here" repeatedly in the wrong contexts. the use of commas needs also another revision, for example in the title.

    Response: Thank you.

    I used “annual average” in L98, L99, L247. I deleted all “here” in my paper. I polished all commas in my paper. But I don’t see commas in my title. Can you tell me where it is again?

    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

Determination of appropriate land use/cover pattern based on the hydroclimatic regime to support regional ecological management in the agro-pastoral ecotone of northwest China

AUTHORS

Yuzuo Zhu

ISSUED ON

April 27, 2024

JOB CODE

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11. Now a list of particular comments on the text:

L. 33 "violently" it´s out of context this adjective
Response: Thank you. I deleted “violently” for better expression (L34).
L. 35 The LUCC is a global mitigation and adaptation strategy in a local context. I suggest adding "adaptation"

Response: Thank you. I added it (L36).

L. 66 "Therefore" and "in this context" are redundant

Response: Thank you. I deleted it (L63).

L. 77 using an abbreviation such as "W" may not be correct depending on the journal's guidelines.

Response: Thank you. I changed it to Wc (L192) and replaced it in all paper.

L. 85-86 the urls should be in the corresponding reference

Response: It is the same as 7.

L. 100-101 the use of averaged instead of average

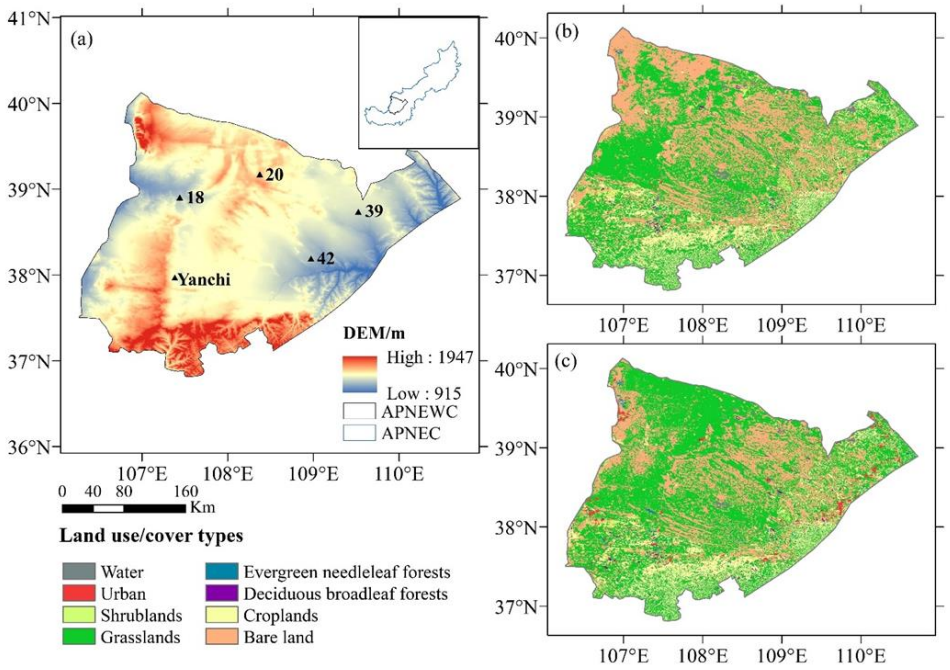
Response: Thanks. I used “annual average” in L98, L99, L247.

L. 102 The term vegetation types is used to refer to land use.

Response: Thank you. I changed it to land use/cover types (L100).

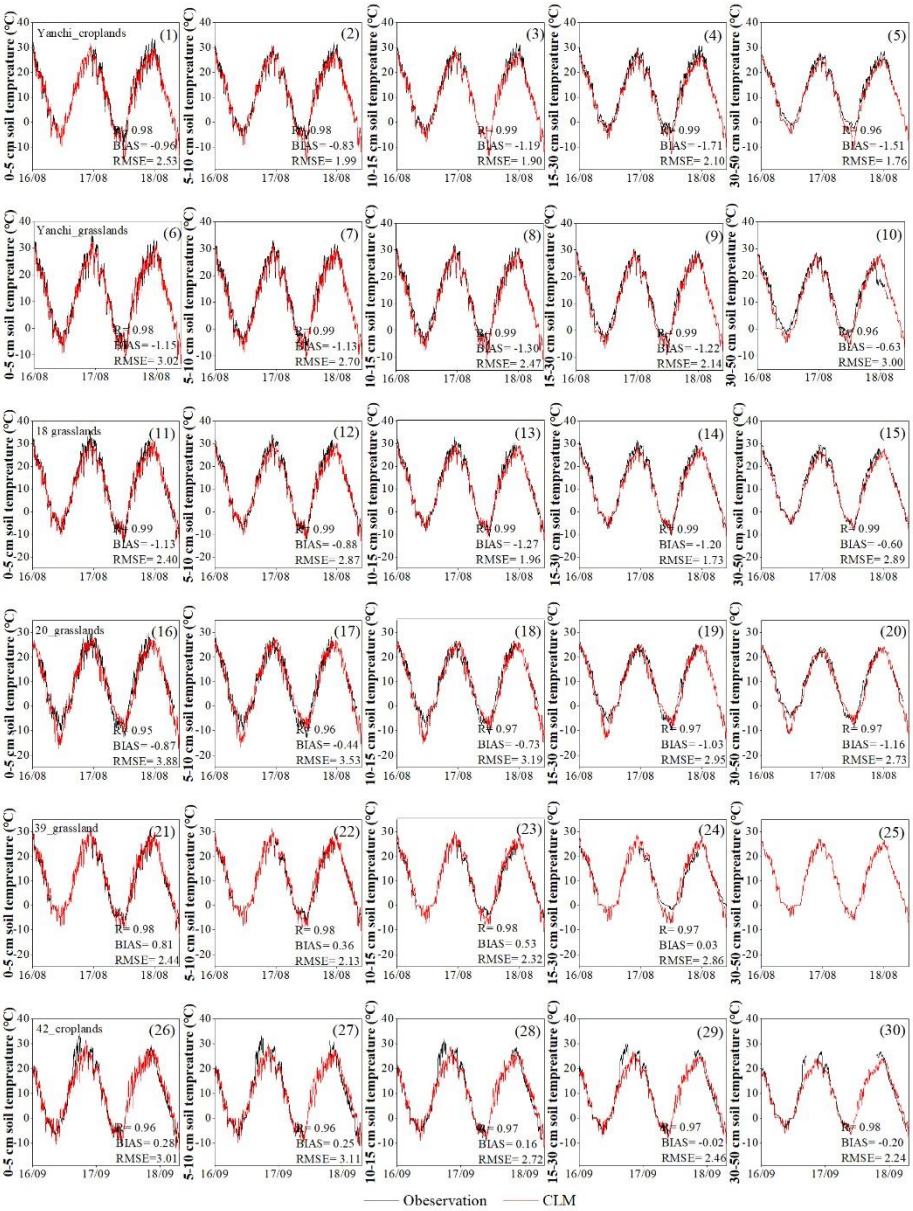
F. 1 The "line" of the river cuts the DEM Legend

Response: Thank you. I revised it (Figure 1. in new version).



F. 3 chart number 20 is missing the metrics

Response: Thank you. I revised it (Figure S2. in new version).



L. 221 The use of "severely"?

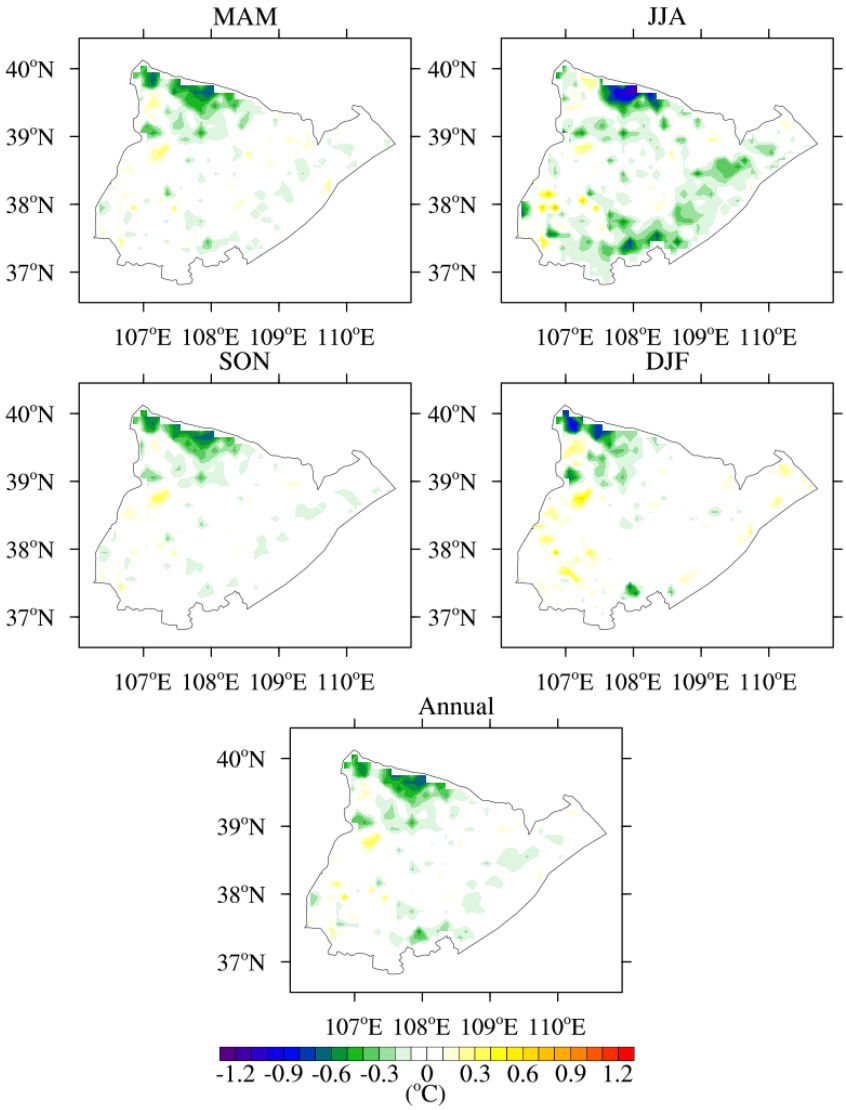
Response: Thank you. I changed it to respectively (L205).

L. 234 "here" it´s wrong used in that way

Response: Thank you. I revised it (L216).

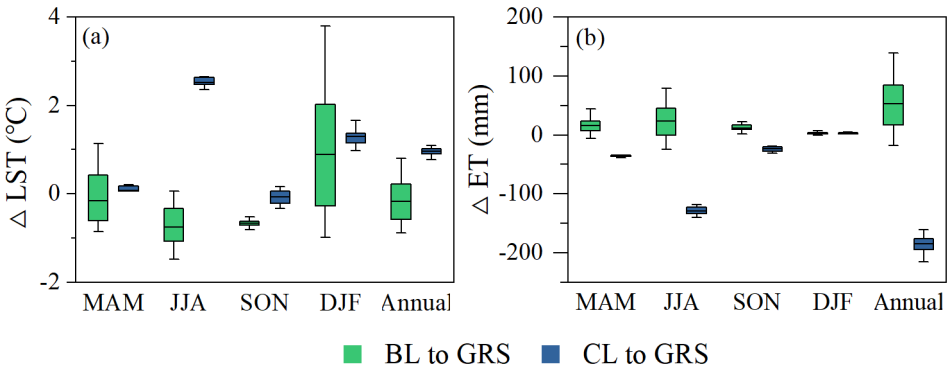
F. 7 the legend use "mm" should be C°

Response: Thank you. I revised it (Figure 2. in new version).



F. 9 The legend "Mean value" it´s not necessary

Response: Thank you. I revised it (Figure 4. in new version).



L. 322 "here" it´s wrong used in that way

Response: Thank you. I deleted it (L292).

L 341-342 the urls should be in the corresponding reference

Response: It is the same as 7.

L. 346 use of "was" talking about 2035

Response: Thank you. I revised it. This expression in the paper is as follows(L312-315):

"Then, the percentage of bare land and croplands, 13 and 30 % respectively, decreases in 2035 to meet the increase in grasslands and is set as the maximum in future scenarios."

L. 348 I dont understand "so five escenarios, which consider computing time, to represent...."

Response: We want to propose different scenarios to meet the requirements of the government. This is to say, the grasslands will increase to 60 %, bare land will decrease from 30 %, and croplands will decrease from 13 % during 2015 to 2035. Countless combinations satisfy this requirement. To save computed time, five scenarios were selected to represent the future.

This expression in the paper is as follows(L313-316):

"Subsequently, to reduce computational time, five scenarios were selected to represent the future. The percentage of grasslands, bare land, and croplands were respectively 60, 21, and 13 % in EXP_602113; 60, 23, and 11 % in EXP_602311; 60, 25, and 9 % in EXP_602509; 60, 27, and 7 % in EXP_602707; 60, 30, and 4 % in EXP_603004."

L.349-350 Repeated information with table 8

Response: Thank you. I deleted Table 8.

L 359. It is repeated many times that the climatic forcings will be left static to isolate the impacts of LUCC, it is not necessary to repeat so many times that, saying that the climatic forcings remain static the rest is understood.

Response: Thank you. I revised it. This expression in the paper is as follows:

"Using static climatic forcings, we compared the difference between future land use/cover scenarios for 2035 and 2015." (L318)

"We ran two experiments in CLM5.0 with two land use/covers (2000 and 2015) and static climatic forcing." (L216)

"Similar to the LST, we only considered the changes in ET directly caused by the LUCC with static climatic forcing." (L223)

L 440. What does it mean that data will be available upon reasonable request? Normally the data is available without conditions.

Response: Thank you. I revised it. "The data will be made available on request" (L410).

Editor

We would like to thank you for your constructive and thoughtful comments. We have implemented all of your suggestions which have led to a much improved and complete manuscript. In the following sections, the issues raised by you are addressed in the order.

1. A main motivation of this study is to propose land cover mixtures that maintain a sustainable ecohydrological environment (abstract). And the methodological approach is to find an optimal land cover that leads to a cooling surface and higher water conservation. What are the limitations of this approach? Are the temperature and water balance the key variables modulating sustainable ecohydrological environment? What about biodiversity, surface runoff, erosion, etc.? Please discuss about this.

   This expression in the paper is as follows(L363-394):

   "Ecohydrological sustainability studies the interaction between water and ecological systems and highlights water as a key driver (Zalewski, 2021). There is always a trade-off between the introduction of plant and water consumption (Jia et al., 2017a). Artificial plants consume more moisture, rapidly depleting local soil moisture and leading to a dry layer in the loess profile (Ren et al., 2018; Fu et al., 2017). Deng (2022) indicated that Wc is a crucial factor that needs to be improved in the APENWC based on the ecological performance evaluation of vegetation restoration. LST is one of the most critical parameters that respond to land surface-atmosphere interactions and is related to the APENWC's surface water budget (Wang et al., 2020; Wei et al., 2018). Additionally, changes in the LST serve as proxies for the severity of extreme events and disturb the ecohydrological environment (Wang et al., 2012; Karnieli et al., 2010). However, other indices may also influence ecohydrological sustainability. (1) Severe soil erosion causes a widespread loss of topsoil and convert the once-flat plateau into hills and gullies, leading to catastrophic floods and droughts on the Loess Plateau of China (Chen et al., 2007; Fu et al., 2017). Since the 1990s, vegetation restoration converted sloping (more than 15°) farmland into forest and grassland, leading to a soil-retention rate of 84.4% on slopes of 8°-35° (Fu et al., 2017). However, in most areas of APENWC, soil erosion was 0–200 (t km-2 yr-1) in 2000 and 2008 (Fu et al., 2011), and the soil erosion rate showed no significant change during the Grain-for-Green Project (Fu et al., 2017). This is because APNEC is not a gully-hilly area, where intense soil erosion occurs. Therefore, the influence caused by soil erosion due to vegetation restoration on the sustainable ecohydrological environment of APENWC is limited. (2) In semi-arid regions such as APENWC, runoff is mainly related to water availability from the perspective of ecohydrological sustainability. Since the 1990s, The Weitu River's runoff has decreased due to the converting unused land into grassland (Zhi et al., 2019). In contrast, runoff increases due to the mixture of LUCC in the Wuding and Kuye River (Zhao et al., 2022; Yang et al., 2024). This study did not use runoff to modulate a sustainable ecohydrological environment. The influence of runoff on ecohydrological sustainability is included in Wc and is defined as the difference between the income and expenditure of water. It represents the capacity to

intercept and store precipitation. Therefore, it better represents the amount of water that can be supplied to the region's interior and exterior middle and lower reaches. (3) During vegetation restoration, the diversity of soil fauna and fungal communities increases, because fast-growing plant species produce large amounts of litter and root exudates, and external resources continually enter the soil food web, which promotes nutrient cycling (Wu et al., 2021; Yang et al., 2021c). Water content between 20 and 60 cm soil depth and soil properties can be regarded as the primary factors explaining plant and soil fungal diversity regardless of land use type (Yang et al., 2017; Wang et al., 2021a). Our study considers water content using water conservation, while soil properties should be included in the future."

2. Please provide a deeper explanation to support the scientific novelty of the study. In the introduction, it says: "Previous studies in APNEC mainly focused on assessing changes in warming effects and water conservation (W) due to LUCC, and giving optimization suggestions based on changes in water conservation or delimiting the optimization area based on high W (Wang et al., 2020; Yang et al., 2021a; Zeng and Li, 2019; Jia et al., 2017a)". Based on the two main objectives of the study (from the introduction), the research gap you are filling with this study is not clear to me.

   This expression in the paper is as follows(L67-90):

   The agricultural pastoral ecotone in Northwest China (APENWC), mainly interlaced by grasslands, croplands, and bare land, is one of the largest agropastoral ecotones worldwide (Li et al., 2018; Xue et al., 2019; Yang et al., 2021a). The land surface vegetation has been experiencing large-scale changes over the last decades due to implemented policies, such as the "Grain for Green Project" and "Three-North Shelterbelt" (Cao et al., 2015; Wei et al., 2018; Liu et al., 2019). These programs have contributed to increased vegetation (Wang et al., 2019b; Wu et al., 2013; Xue et al., 2019; Zhang et al., 2018) and vegetation restoration has led to increased soil moisture consumption (Yang et al., 2021a), reduced runoff (Liang et al., 2015; Zhang et al., 2016), increased ET (Wang et al., 2019a) and decreased LST (Wang et al., 2020). However, some studies have pointed out that excessive re-vegetation causes adverse effects, such as soil drying (Jia et al., 2017b; Zhang et al., 2018), indicating that incorporating proper land use/cover into decision-making suitable for the APENWC standing perspective of ecohydrological sustainability is urgently required. Additionally, the latest national ecological development project plans to expand grasslands to 60 % in China and continue to convert bare and agricultural lands to grasslands to improve ecosystem services in the APNEC from 2021 to 2035 (China state council, 2017; National development and reform commission, 2019). However, this plan that expands grasslands to 60 % has not been robustly tested, and little was done to propose the proper percentages of croplands and bare land suitable for the APENWC under the government plan.

   The main method for optimising land use/cover is to simulate the land/user cover scenario by setting different requirements for social services and economic and ecological environments (Kaim et al., 2018; Kucsicsa et al., 2019). In the APENWC, the optimised configuration was obtained by setting parameters with different weights of economic profit and ecological parameters in scenario simulations using a Multi-Objective Genetic Algorithm (Yang et al.,

2020). However, optimisation algorithms cannot change LUCC to meet the government's preset values (e.g., 60% grassland). In addition, theoretical studies on parameter settings are insufficient, limiting the simulation performance (Ding et al., 2021). Thus, this contribution uses the hydroclimatic thresholds to pursue a practical land management plan for the first time for the government's plan standing perspective of ecohydrological sustainability within scenario simulations of different vegetation restorations under CLM 5.0. The objectives of this study were 1) to quantify the respective and synergistic impacts of different types of LUCC, and 2) to find a proper mixture of land use/cover in the APENWC for 2035.

3. Revise the Discussion to clarify the main messages of the subsections. E.g., 4.1 Role on what? 4.2 Uncertainties related to soil properties?

   Response: Thank you. I revised it as follows:

   4.1 Sensitivity of LAI + SAI and vegetation height (L331)

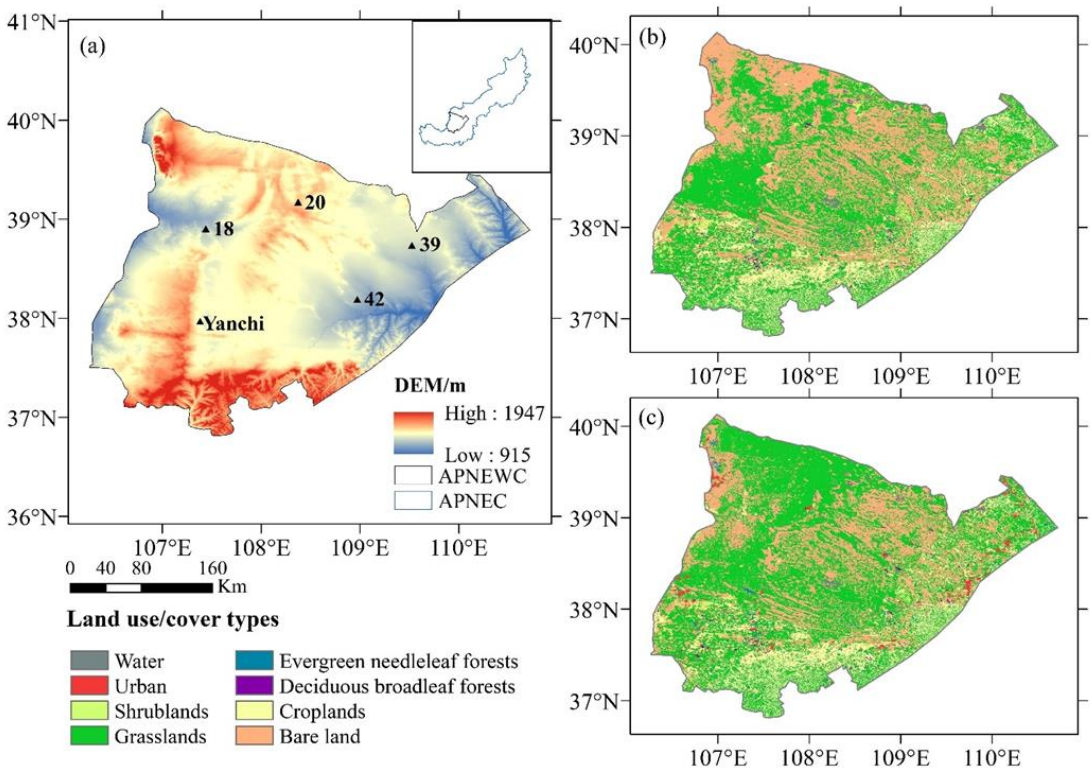
   4.2 Uncertainty of soil properties (L346)

4. I agree with reviewer 2 regarding the need to carefully review the entire text and correct the grammatical errors. The grammatical errors in the current version of the manuscript hinders readability and communication of the scientific message.

   Thanks! The new manuscript has been edited to ensure language and grammar accuracy by professional editors at Editage. The editing certificate is as follows:

5. Fig. 1: I recommend to change the colors since forests and grasslands are too similar.

Response: Thank you. I revised it (Figure 1. in new version).


(a)
(b)
(c)
41°N
40°N
39°N
38°N
37°N
36°N
107°E
108°E
109°E
110°E
20
18
39
42
Yanchi
DEM/m
High : 1947
Low : 915
APNEWC
APNEC
0 40 80 160
Km
Land use/cover types
Water
Urban
Shrublands
Grasslands
Evergreen needleleaf forests
Deciduous broadleaf forests
Croplands
Bare land