

Response to referee comments

We thank the two reviewers and the editor for the precious and constructive suggestions to improve our manuscript. We carefully revised our manuscript and addressed the comments of each of the two reviewers. Please find our point-by-point response below.

Referee #2

The authors developed a dataset to document cropland area over the past 1000 years in the North China. By using historical records and recent datasets, the manuscript particularly looked at the spatial changes and possible improvement to the accuracy of the regional dataset. I have a few concerns and suggestions for the authors to consider if they decide to revise the manuscript.

Response: Thank you very much for your constructive comments on our manuscript. We appreciate the time you spent reviewing our manuscript. Please find our point-by-point response below.

1. The novelty of this manuscript is not clearly presented. The authors have already published a few similar papers in the past few years, and even one for the Northeast China region. The only difference is the time period covered here. Land use change, especially for such long history with spatial coverage, is deemed important in understanding carbon budget, land emissions, and many other studies. This is what the authors also emphasized in the Introduction. However, this particular study presented only a few snapshots (i.e., 28), and just one relatively small area in China (not the ones with rich ancient history like capitals or the areas along the rivers/Yellow River that nurtured Chinese agriculture). Why is this study so unique and important? This can be made clearer in the Introduction.

Response: Thank you for your helpful suggestion, and we apologize if this was unclear. We reorganized the introduction to make it more coherent, and also describe the novelty and the uniqueness of this study. Please see Line 25-74.

2. Also, please note that the current Introduction is quite similar to what's included in the Jia 2023 paper published at *Regional Environmental Change*, both the structure and argument of novelty. Quite a few sentences from the 2023 paper are used here again. This is not acceptable.

Response: Thank you for your helpful suggestion, and we apologize if this was confusing. We revised the structure and argument, and we also reorganized the introduction to make it more coherent. Please see Line 25-74.

3. Next, in terms of the methods used here compared with others published by the same group of authors including the 2023 one, any significant difference besides data/records used? Any improvement to the methods? Could we expect any improvement of methods from an additional paper? HYDE have already developed global scale LUC data, with even longer history and higher resolution, and this study has always compared their results with HYDE. From what angle can we justify that this dataset has “higher reliability” or can “improve the accuracy and reliability”? Comparing a regional study with global work, or filling a few missing data (aim 1) do not make this a better paper. The authors need to better clarify the intention, methods, and even the comparison in the discussion.

Response: Thank you for your insightful suggestion, and we apologize if this was confusing. Compare to 1000-1200, we developed cropland calculation indicators for 1300-1600 corresponding to different population categories (Please see Table 1, Line 592-614), and the algorithm to reconstruct the cropland by population is different (Please see the supplement material).

In this study, we used the improved historical cropland reconstruction methods to reconstruct 28 time-points cropland area by assimilating multiple data sources. Reconstruction of cropland area from 1000 to 1600 primarily relies on historical documents, population data. Furthermore, we used the most authoritative historical population data in China: "*History of Population of China*" and the cropland calculation indicators during this period corresponding to different population categories (Please see Table 1, Line 592-614 and the supplement material). We also attempt to analyze the

rationality of our dataset based on the population changes, settlements changes, warfare, and land policies that may have influenced land cultivation in Northeast China during the Liao, Jin, Yuan, and Ming periods (1000-1600) (Please see Line 536-578, Fig. S1).

Overall, we reorganized and supplemented some content to better describe the intention, methods, and the comparison in the discussion. Please see Line 25-74, 211-261, 416-625 and the supplement material.

4. L24: again, the Introduction is quite similar to Jia 2023, this has to be revised to be acceptable anywhere?

Response: Thank you again for your helpful suggestion, and we apologize if this was confusing. We reorganized the introduction to make it more coherent. Please see Line 25-74.

5. L52: aims not aim.

Response: Thank you for your suggestion. We reorganized the aims to make it more coherent. Please see Line 72-74.

6. L55-57: how many aims do you have exactly? Two or four? These do not seem to be complete sentences.

Response: Thank you for your suggestion, and we apologize if this was confusing. We reorganized the aims to make it more coherent. Please see Line 70-74.

7. L113: this seems to be quite large for per person, can this value be used for the whole region?

Response: Thank you for your helpful suggestion, and we apologize if this was confusing. The definition of the Man is the adult labor force of a household (a male between the ages of 15 and 50 years in the Liao Dynasty; a male between the ages of 17 and 59 years in the Jin Dynasty; a male between the ages of 15 and 59 years in the Yuan Dynasty; a male between the ages of 16 and 60 years in the Ming Dynasty). The conclusion of 14 *Mu* per Man for agricultural population during this period (1000~1600)

is primarily derived from historical records in the Jin Dynasty (1200) and the relationship between population and cropland in the early Qing Dynasty (1661~1680) (Jia et al., 2023). And we also discussed the uncertainty of this value. Please see Line 115, 121, 143, 165, 592-614.

References:

Jia, R., Fang, X., and Ye, Y.: Gridded reconstruction of cropland cover changes in Northeast China from ad 1000 to 1200, *Reg. Envir. Chang.*, 23, 128, <https://doi.org/10.1007/s10113-023-02118-y>, 2023.

8. L384: The method is done by now, but how did you compute the spatial distribution of cropland across time? The previous methods mainly focused on total area numbers, but should the spatial pattern change with time, as the factors influencing cropland distribution change? For the area records, would the administrative region boundary change over time, which affect the statistics? Fig. 5 is an example that may be impacted by boundary changes.

Response: Thank you for your insightful suggestion.

From 1000 to 1600, the provincial-level administrative districts were derived from the Historical Atlas of China (Tan, 1982a; Tan, 1982b), and the cropland area during this period was reconstruction primarily relies on the population data in different provincial-level administrative districts.

The unified administration boundaries may affect the correct records of cropland. When we unified administration boundaries from 1700 to 1980, we referred to similar studies and adopted the similar method (Wei et al., 2019). Moreover, we performed this operation first at the time points with data records. After obtained all the cropland area at the modern administrative divisions of all time points, we performed linear interpolation and polynomial curve fitting to obtain the cropland area at standard time points, which had relatively less impact on cropland records. Please see Line 203-261.

In addition, a study has indicated that the county-level administrative divisions are the most stable administrative division level in Chinese history (Zhao et al., 2024). Even

so, the cropland area of each county estimated by this method in this study is still uncertain, and we have further described the uncertainty in Uncertainty analysis section.

Please see Line 619-625.

References:

Tan, Q.: The Historical Atlas of China, Volume 7, SinoMaps Press, Beijing, China, 1982a (in Chinese).

Tan, Q.: The Historical Atlas of China, Volume 6, SinoMaps Press, Beijing, China, 1982b (in Chinese).

Wei, X. W. X., Ye, Y. Y. Y., Zhang, Q. Z. Q., Li, B. L. B., and Wei, Z. W. Z.: Reconstruction of cropland change in North China plain area over the past 300 years., *Global & Planetary Change*, 60-70, 2019.

Zhao, Y., Wang, K., Zhao, B., and Wang, F.: Spatio-temporal process and pattern of the establishment of county-level administrative divisions in China in the past 2200 years, *Acta Geographica Sinica*, 79, 890-908, <https://doi.org/10.11821/dlxb202404005>, 2024.

9. L455: there are several comparisons here, how do you justify that your estimates are better than others? Or do you suggest that as long as you have more data records then it should be more accurate?

Response: Thank you for your helpful suggestion, and we apologize if this was confusing. Our dataset assimilated multiple data sources (e.g.: historical documents, population data, garrison reclamation data, revised published results, statistical data, land survey data and RS data) and based on the improved historical cropland reconstruction methods (e.g.: cropland calculation indicators for different historical periods corresponding to different population categories), and the trend of increase and decrease of cropland area consistent with historical facts.

In addition, we acknowledge that the current paper's reliability, accuracy, or uncertainties assessments are not yet sufficiently comprehensive. We have made every effort to supplement the relevant assessments and uncertainty analysis as much as possible. And we deleted some description of the spatiotemporal variation

characteristics of cropland area. Please see Line 382-412, 416-625.

10. L514: this is NOT “uncertainty analysis”, there is no “analysis” at all. Just some random discussions.

Response: Thank you for your helpful suggestion, and we apologize if this was confusing. We have reorganized the structure of the “Uncertainty analysis section”, and added more specific and detailed description to analyze uncertainty. Please see Line 579-625.

11. L533: don’t you think the conclusion is a bit too long?

Response: Thank you for your helpful suggestion. We have reorganized the “Conclusion section”. Please see Line 630-649.