A spatially-explicit cropland distribution time-series dataset is necessary for the accurate assessment of biogeochemical processes in terrestrial ecosystems and their feedback to the climate system. This study reconstructed a continuously covered cropland distribution dataset in China spanning from 1900 to 2016 by assimilating multiple data sources and identified the abandonment and expansion of cropland, which has important contribution to this research area. However, some questions are as follows:

Response: We thank the reviewer for valuing our work!

1. Many scholars (Li, Yang, Wei et al.) have done the research on the gridding allocation of cropland in China during the 300 year. Why do you choose 1900 as the starting time point to repeat the allocation? Whether you have more dependable historical data sources for 1900 to 1949 or have you revised some time section's value?

   Response: We thank the reviewer for pointing out this. Exactly, many scholars have done great jobs in rebuilding the cropland distributions in China for the past 300 years. We chose 1900 as the starting time point because of two reasons. First, previous researches have done very good jobs in allocating cropland spatially in early periods (e.g. He et al 2003, Wei et al 2019, Ye et al 2009). The approaches used in these previous studies have more complex mechanisms than our model, while our model highly relies on the abundance of gridded data available. Since we do not have better data sources in early period, our major focus is to correct the biases in cropland area changes for the period since 1949. Second, we simply extrapolated cropland distributions from 1949 back to 1900 for serving the simulations demands of the modeling community, which generally requires a historical, annual cropland maps for model input. According to the previous studies (e.g. Li et al 2016, Yang et al 2015), the cropland changes from the end of the 19th century to the early 20th century are relatively minor. Therefore, we simply used the trends of cropland changes during the periods of 1887-1933 and 1933-1952 to gap-fill the data during the period of 1900-1948 in this study. The cropland data in 1887, 1933, and 1952 were obtained from Yang et al (2015).

   References:

   He, F. N., Tian, Y. Y., & Ge, Q. S. (2003). Spatial-temporal characteristics of land reclamation in Guanzhong region in the Qing Dynasty. Geographical Research, 22(6), 687-697.

   Li, S., He, F., & Zhang, X. (2016). A spatially explicit reconstruction of cropland cover in China from 1661 to 1996. Regional Environmental Change, 16(2), 417-428.

Wei, X., Ye, Y., Zhang, Q., Li, B., & Wei, Z. (2019). Reconstruction of cropland change in North China Plain Area over the past 300 years. Global and Planetary Change, 176, 60-70.

Yang, X., Jin, X., Guo, B., Long, Y., & Zhou, Y. (2015). Research on reconstructing spatial distribution of historical cropland over 300 years in traditional cultivated regions of China. Global and Planetary Change, 128, 90-102.

Ye, Y., Fang, X., Ren, Y., Zhang, X., & Chen, L. (2009). Cropland cover change in Northeast China during the past 300 years. Science in China Series D: Earth Sciences, 52(8), 1172-1182.

2. Whether this study considered the difference between pure and mixed cropland grid cells, or different proportion range of cropland grid cells in different remote-sensing products when they are used for reconstruction?

   Response: We thank the reviewer for pointing out this. For some of the datasets, the grids are classified to pure and mixed croplands. A typical example is the MODIS land cover product under the IGBP classification system, which includes land cover type categories of croplands and cropland/natural vegetation mosaics. However, the classifications of the datasets used in this study do not include mixed cropland type, although the grids definitely include mixed cropland in different datasets. Specifically, we chose Plant Functional Types (PFT) classification for MODIS data, in which cropland is divided into cereal cropland and broadleaf cropland (see explanation below). Therefore, the grids are either cropland or non-cropland in the datasets used in this study. For example, the GlobeLand30 and GFSAD30m are Boolean type data specifically designed for describing cropland distribution. Thus, we avoided using "mixed cropland" classification type. Croplands were separated from other land cover types and converted into Boolean type for model input.

   Note that all these datasets, including high-resolution GlobeLand30 and GFSAD30m, have both pure and mixed cropland grid cells. However, we were unable to separate pure and mixed cropland grid cells from these datasets. Therefore, we designed the model to give priority to higher resolution gridded product in cropland allocation. For example, the MODIS data with 500-m resolution has a higher priority than the contemporary, 1-km resolution data (e.g. GLC2000), but a lower priority than the 30-m resolution data (e.g. CNLUCC). We chose the PFT classification system for MODIS land cover product, in which cropland are defined as grid cells dominated by cultivated crops (>60%). Therefore, all the datasets were converted to Boolean-type images, namely each grid cell is either cropland or other non-cropland, and the cropland grids within each dataset were treated equally. By giving different priorities to each dataset, the weighting scores help reduce the possibility to allocate cropland to grids with low crop coverage.

3. For satellite-data period and pre-satellite era (1900-1979), this paper has used different spatializing approach. For gridding images, cropland fraction, distance to urban, correlation with previous years and resolution were considered for the weighted value in the potential cropland map in this paper. So, the results, to a large extent, will be decided by the dependability of different satellite products. Whether you have think about the priority of high resolution and dependability of remote-sensing products ï¼Ÿ Or change another word, for China, maybe GlobalLand30 or Gong's data is more fit for?

   Response: This is a great suggestion! We agree with the reviewer's suggestion and included GlobalLand30 or Gong's data (FROM-GLC) for updating the reconstruction of the cropland during the period before 1979. More specifically, the two datasets were given the same priority as the Yang's data in cropland reconstruction. We believe that Yang's data provides important cropland distribution signals in the early period, and GlobalLand30 and Gong's data (FROM-GLC) also contain the footprint of the early cropland information. The cropland maps have been reconstructed and undated (see https://figshare.com/articles/dataset/ChinaCropland_zip/13356680).

4. Reconstruction of low cultivation ratio regions maybe has large uncertainty, especially Xinjiang and XiZang, where the results of crop distribution area or intensity all exists unreasonable. You had better analyze it more from the view of method uncertainty or discrepancy of different sets of products.

   Response: We thank the reviewer for the suggestion. We rechecked and compared the cropland distribution in low cultivation region of Xinjiang and Xizang (Tibet). Indeed, the cropland distributions in these two provinces are quite different between studies. Generally, our reconstructed cropland was similar to these published results or products in Xinjiang (e.g. cropland product from: http://www.dsac.cn/DataProduct/Detail/20081129, Liu et al (2005)), while the discrepancy in Xizang is much larger (e.g. comparing with Li et al (2016), Liu et al (2005), and the product from: http://www.dsac.cn/DataProduct/Detail/20081127). We found that our reconstructed cropland in Xizang in 2016 (4446 km^2) is the same as the official released data from the Ministry of Land and Resources of China, which is also close to the cropland areas released in the local government report http://nynct.xizang.gov.cn/xwzx/bmdt/202007/t20200715_162472.html) and Liu et al (2005) (4422 to 4690 km^2 in the period of 2000 to 2019). Thus, the major discrepancy lies in the spatial distribution of the croplands.

   Therefore, we summarized the cropland area in Xinjiang and Xizang from the top four priority datasets used in our model (Table 1). During the 2010s, the reconstructed cropland maps were mainly determined by the top four datasets at 30-m resolution, namely the GFSAD30m, CNLUCC, GlobeLand30m, and FROM-GLC. We found that FROM-GLC has a much broader distribution of low cultivation grids (Figure 1b), which contributed to the wide coverage of low cropped intensity area (Figure 2a), especially in Xizang region. Therefore, we reduced the priority of the FROM-GLC dataset (priority ranked after the other three 30-m datasets), and reconstructed the cropland in 2010s (Figure 2b). We found that this adjustment reduces the low cultivation area, especially in Xizang region. We believe the improvement help decrease the uncertainty in spatial distribution of the reconstructed cropland maps. The updated croplands have been uploaded and replaced the old version online (see https://figshare.com/articles/dataset/ChinaCropland_zip/13356680).

Table 1. Summary of cropland area in Xizang and Xinjiang from different datasets

Region	Datasets	Cropland area (km^2)	Year
Xizang (Tibet)	GFSAD30m	1213.99	1990-2017
	FROM-GLC	2947.54	2017
	GlobeLand30m	5080.42	2010
	CNLUCC	7672.57	2018
Xinjiang	GFSAD30m	62925.14	1990-2017
	FROM-GLC	83905.41	2017
	GlobeLand30m	82188.25	2010
	CNLUCC	90290.61	2018

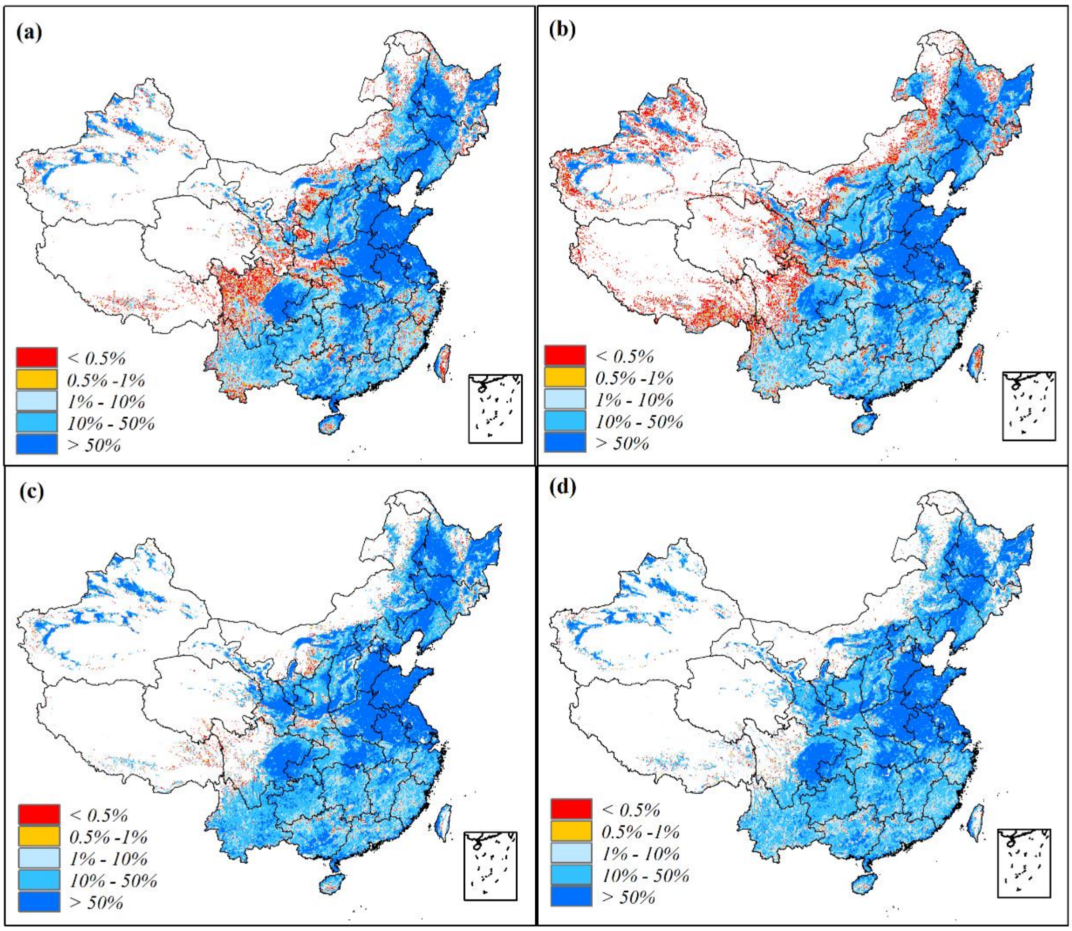

Figure 1. Comparison of cropland distributions from (a) GFSAD30m, (b) FROM-GLC, (c) GlobeLand30m, and (c) the CNLUCC (cropland maps were directly resampled to 5-km; the low cultivation area (cropland coverage <0.5% and 0.5%-1.0%) was highlighted in red and yellow).

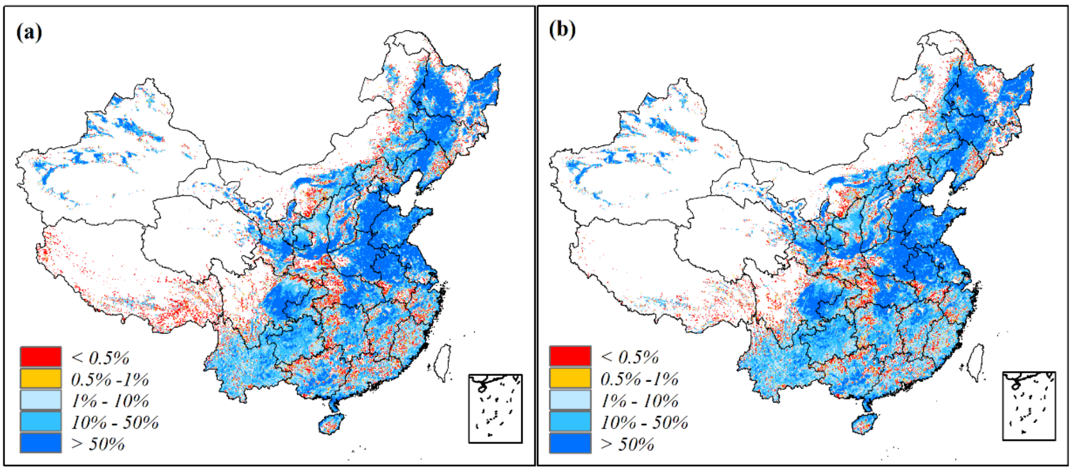

Figure 2. Comparison of the reconstructed cropland in 2016 before and after adjustment (a: before adjustment; b: after adjustment)

Reference:

1) Li, S., He, F., & Zhang, X. (2016). A spatially explicit reconstruction of cropland cover in China from 1661 to 1996. *Regional Environmental Change*, *16*(2), 417-428.
2) Liu, J., Liu, M., Tian, H., Zhuang, D., Zhang, Z., Zhang, W., ... & Deng, X. (2005). Spatial and temporal patterns of China's cropland during 1990–2000: an analysis based on Landsat TM data. Remote sensing of Environment, 98(4), 442-456.
3) Cropland report of Xizang: http://nynct.xizang.gov.cn/xwzx/bmdt/202007/t20200715_162472.html (last accessed April 18th, 2021)

5. For data in 1900-1979, what's the difference between Yang's constrained CA models with other scholars' method? For example, Wei's "the partition and layering-based gridded method" or Li's method are all based on land suitability for cultivation affected by climate, soil and elevation etc. What's the significance of this study on methodology?

   Response: We thank the reviewer for pointing out this. Many researchers have reconstructed historical land use using "top–down" decision-making method to match overall cropland area to land parcels using land arability and universal parameters. In comparison, Yang's constrained Cellular Automaton (CA) model is a "bottom–up" model considering the concentrated distribution of cultivated land and various factors influencing cropland distribution, including environmental and human factors. In Yang et al (2015), the CA model takes a historical cropland area as an external variable and the cropland distribution in 1980 as the maximum potential scope of historical cropland. In reconstruction of historical cropland distribution, Yang et al (2015) selected elevation, slope, water availability, average annual precipitation, and distance to the nearest rural settlement as the main influencing factors of land use suitability. Besides, an available labor force index is used as a proxy for the amount of cropland to inspect and calibrate these spatial patterns.

   The figure 3 illustrated the differences of using "top–down" and "bottom–up" models in cropland reconstructions. The "top–down" model in combined with the proportional allocation approach tends to produce a historical cropland map with spatial pattern highly close to the recent cropland map (Figure 3a). Examples are the studies such as Li et al (2016) and Wei et al (2016). In comparison, the "top–down" model in combined with the Boolean allocation approach produces a cropland map less similar to the recent cropland (Figure 3b), in which the lower suitability grids were prioritized to be removed in cropland reconstruction (e.g. HYDE 1.1 data). While Yang's "bottom-up" method tends to remove the scattered, lower suitability grids in cropland reconstruction, which is also adopted in Long et al (2014). Therefore, Yang 's model assumes that scattered, fragmented cropland girds were cropped later and should be removed with priority in historical cropland reconstruction.

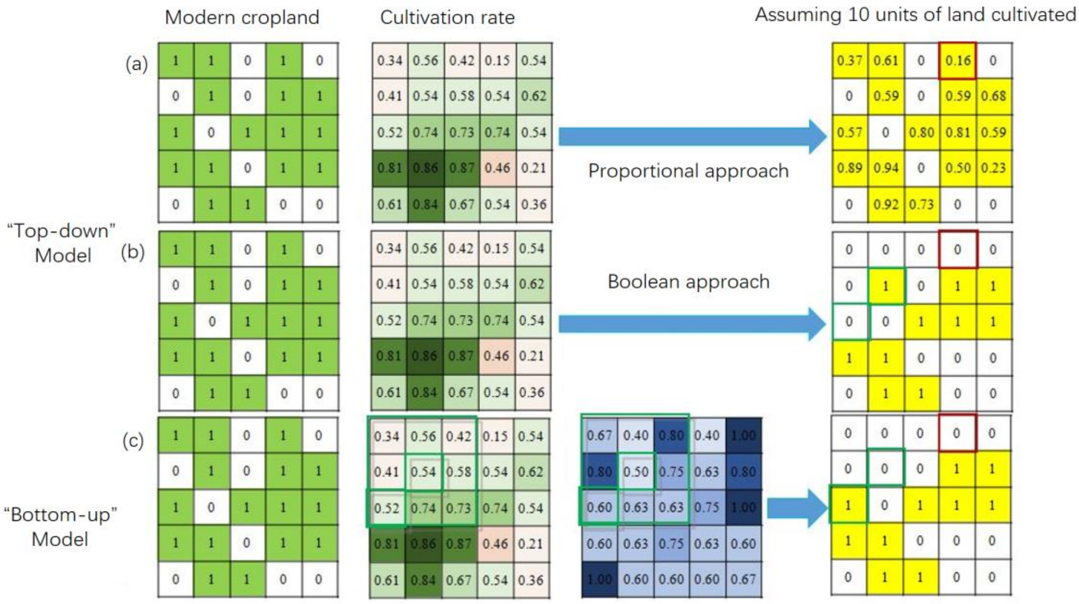

Figure 3. Comparisons of spatial patterns cropland reconstructed from different approaches