Reconstructing of long-term statistical areas as well as the spatial distribution of historical cropland are essential to track the dynanmics of the agriculture development and to analysis the driving factors from natural and anthropological aspects. The manuscript collected and integrated different data source to reconstruct time series cropland layers since 1900. The topic is of interests to researchers and has potential to be published on ESSD. However, some major issues must be addressed before considered in ESSD.

Response: We thank the reviewer for valuing our work!

1.When working on the spatializing of cropland distribution, the first type of gridded images was used assuming higher weighting factors with a higher value given to a higher resolution image. However, did the authors test the consistency or inconsistency of different existing land cover dataset? At many cases, the consistency at many regions is low which introduced high uncertainty at the cropland allocation steps.

Response: We thank the reviewer for the suggestion! Exactly, the consistency in many regions is low for different gridded products. We did briefly and visually check the consistencies between different products, and there are few general patterns. First, the consistency is generally higher between high-resolution products than the consistency between high and low-resolution products. Second, the consistency is generally higher in more intensively cultivated regions. As the reviewer pointed out, the low consistency regions are therefore high in uncertainty, which also majorly distributed in the low cropland coverage area. For example, we compared the four 30-m resolution products used in reconstructing cropland in 2010s (i.e. the GFSAD30m, CNLUCC, GlobeLand30m, and FROM-GLC), and found that the major differences were located in the low cultivation area (Figure 1). Therefore, the gridded products are differed in satellite sensors, noise sources, spatial/temporal/spectral resolutions, and algorithms used, which make it difficult to directly compare these products. Fortunately, they were all validated before released for public use, indicating they are capable of capturing cropland distribution/change signals to a certain extent.

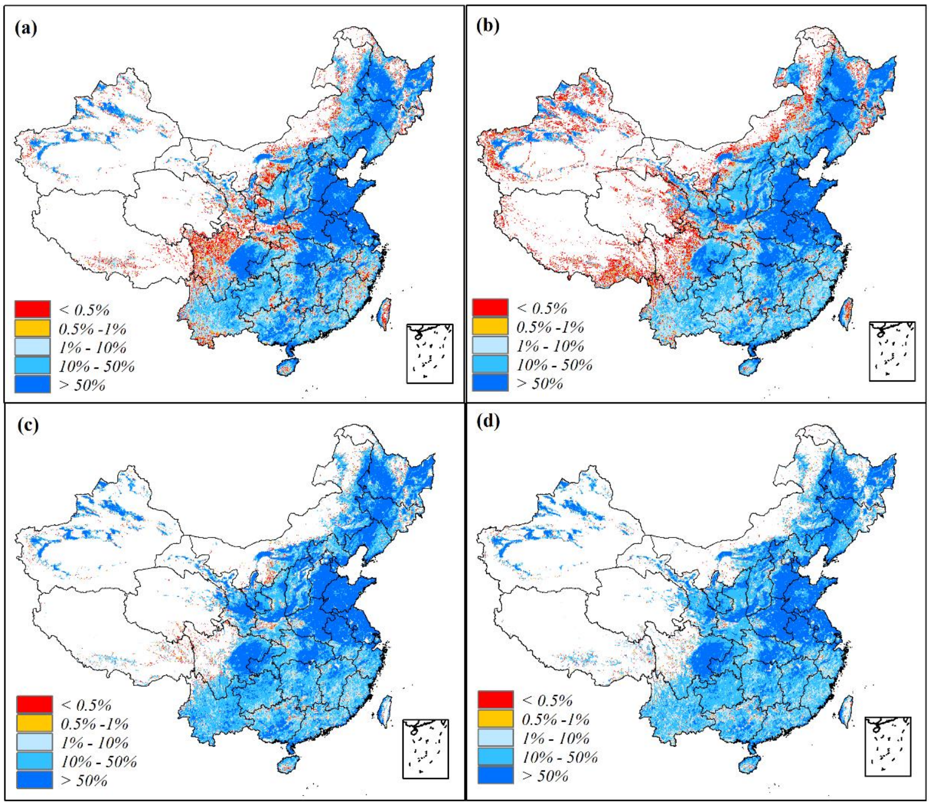

Figure 1. Comparison of cropland distributions from (a) GFSAD30m, (b) FROM-GLC, (c) GlobeLand30m, and (c) the CNLUCC (cropland maps were directly resampled to 5-km; the low cultivation area (cropland coverage <0.5% and 0.5%-1.0%) was highlighted in red and yellow).

The high-resolution datasets were more intensively validated using ground-observed data. For example, over 38, 000 samples used in validations of FORM-GLC products (Gong et al 2013, Yu et al 2013). Based on the preliminary check and to reduce the uncertainty, we therefore develop the reconstruction model based on two assumptions. First, higher priorities were given to higher resolution gridded products. Second, higher priorities were given to grid cell more frequently identified as cropland using multiple datasets. This approach used in our model is targeted at reducing the uncertainty introduced by a single product. Besides, according to the suggestion raised by the other reviewer, we also validated the accuracy of the intermediate product (Boolean type map at 100-m resolution before aggregating to 5-km cropland percentage map) using the Global validation sample set v1 (http://data.ess.tsinghua.edu.cn/) (see more details in the response to the third comment).

References:

1) Gong, P., Wang, J., Yu, L., Zhao, Y., Zhao, Y., Liang, L., ... & Chen, J. (2013). Finer resolution observation and monitoring of global land cover: First mapping

results with Landsat TM and ETM+ data. International Journal of Remote Sensing, 34(7), 2607-2654.

2) Yu, L., Wang, J., & Gong, P. (2013). Improving 30 m global land-cover map FROM-GLC with time series MODIS and auxiliary data sets: a segmentation-based approach. International Journal of Remote Sensing, 34(16), 5851-5867.

2.When spatializing the cropland data from statistical area to grid level, why first generated 100m binary cropland & noncropland map and then resampled to 5km grided percentage map? Is it more straightforward to generate the possibility of cropland (0-100) at 5km grid level?

Response: We thank the reviewer for the suggestion! Indeed, it is more straightforward to understand by generating the possibility of cropland at 5 km grid maps. However, the method used in this study is derived from the model developed in our previous study (Yu and Lu 2018). This is a "top-down" model with a general process to assimilated different sources of datasets. Based on the results and analysis, we found that the updated model has decent performance in cropland reconstruction.

Reference:

Yu, Z. and Lu, C.: Historical cropland expansion and abandonment in the continental U.S. during 1850 to 2016, Glob. Ecol. Biogeogr., 27(3), 322–333, doi:10.1111/geb.12697, 2018.

3.After 1980s when Landsat imageries became available, why not to use multi-annual actual satellite data as a validation source to prove the effectiveness of the spatializing approach?

Response: We thank the reviewer for the suggestion. This is a good method to validate our results and model. However, to use the Landsat imageries, a classification approach will be needed to convert the images into gridded cropland maps or classified land cover maps to compare with our reconstructed maps. Since many of the input data products used in our model were derived from Landsat imageries and have been intensively validated, it seems repetitive to perform the validation using Landsat imageries. For example, FORM-GLC maps were derived from Landsat TM/ETM+ and MODIS data and validated using > 38000 samples (Gong et al 2013, Yu et al 2013); the Globeland30m was derived from Landsat TM/ETM+/OLI, and HJ-1 data and validated using >230,000 samples (Jun et al 2014).

We agree that the reviewer's suggestion is very helpful. Therefore, in combined with the other reviewer's suggestion, we used the ground-true observations to validate our spatializing approach. Despite that direct validation of our 5 km cropland product is not suitable as traditional error matrix and accuracy assessment is designed for validation of classified land cover maps. The cropland product we reconstructed describes cropland in percentage, and thus the site-based validation is not directly applicable. Therefore, we chose the intermediate product (Boolean type map at 100 m resolution before aggregating to 5 km percentage map) derived from multiple data sources for the validation using the Global validation sample set v1 (http://data.ess.tsinghua.edu.cn/). The intermediate product describes the high possibility of absence (0) or presence (1) of cropland in each gridcell, but other land cover types were not available. Therefore, we directly compared the intermediate product with cropland sites provided in the Global validation sample set. We found that, in total of the 356 cropland sites from mainland China, 219 (62%) of the sites were correctly identified in our intermediate product (from 2001 to 2010), which is in the range of 198 (56%) to 248 (69%) identified from the MODIS product (MOD12Q1, from 2001 to 2014) and the GFSAD30, respectively. However, since the intermediate product is not the focus of this study, we added this information to the supplementary file. This also revealed that our spatializing approach is reasonable.

Reference:

Jun, C., Ban, Y., & Li, S. (2014). Open access to Earth land-cover map. Nature, 514(7523), 434-434.

Some minor comments:

1.CNLUCC products are illustrated in figure 1 at different time period but in the description of the figure 1, only CAS1990 is described. Are those two different sources ï¼ŸIn Figure 2, both CNLUCC and CAS1990 are not included as a comparison source. Is the ignorance of those dataset by purpose or by mistake?

Response: We thank the reviewer for pointing out this. It is confusing for readers as CNLUCC and CAS1990 are produced by two research groups from the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences. Therefore, we added a citation for CAS1990 and also added the description of CNLUCC for clarification:

“CAS1990: Land Cover data originated from 1:1,000,000 land use map produced by the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (Ran and Li 2006)”.

“CNLUCC: China Land Use and Cover Change was provided by the Data Center for Resources and Environmental Sciences, Chinese Academy of Sciences (RESDC) (http://www/resdc.cn) (Xu et al 2005).”

We thank the reviewer for pointing this out. Yes, the cropland areas of CNLUCC and the other five datasets (i.e. IGBP Data and Information System, UMD Land Cover, GLC2000, CAS1990, and WESTDC Land Cover Product 2.0) were not included in the figure. To increase the readability of the figure, we averaged the cropland area from the five datasets and indicated by Ran's data in the new figure. The new figure is updated to include CNLUCC and Ran's data:

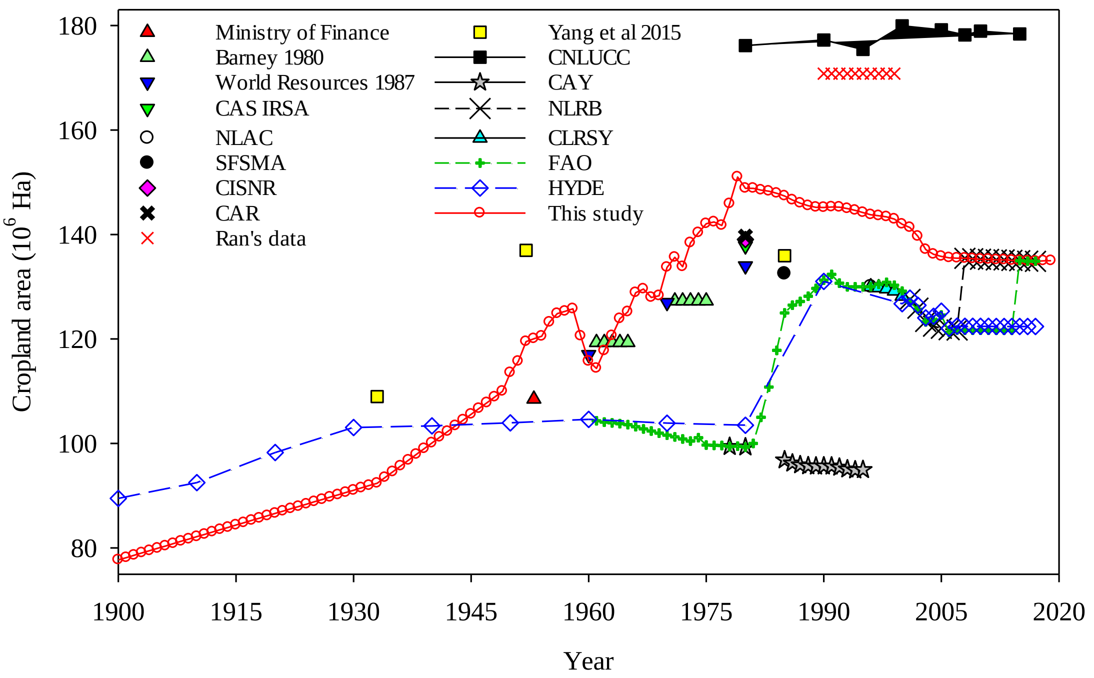

Figure 2. Comparisons of national cropland area data from different sources. (Barney 1980: the number from Barney (1981); World Resources 1987: Institute et al. (1987); NLAC: National Land Administration of China; SFSMA: Soil Fertility Station of the Ministry of Agriculture; CAS IRSA: Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences; CISNR: Committee of Integrated Survey of Natural Resources; CAR: Committee of Agricultural Regionalization; NLRB: National Land and Resources Bulletin; CLRSY: China Land and Resources Statistical Yearbook; Ran's data: The average of five datasets prepared by Ran and Li (2006) and Ran (2013), including IGBP Data and Information System, UMD Land Cover, GLC2000, CAS1990, and WESTDC Land Cover Product 2.0; CNLUCC: China Land Use and Cover Change dataset obtained from the Data Center for Resources and Environmental Sciences, Chinese Academy of Sciences.)

References:

1) Ran, Y. and Li, X.: Comparison report of the four 1-km land cover products of China, Lanzhou., 2006

2) Xu, X. L., Pang, Z. G., & Yu, X. F. (2005). Spatial-Temporal Pattern Analysis of Land Use/Cover Change: Methods &Applications. Science and Technology Literature Press: Beijing, China, 90-130.

2.The authors compared the provincial cropland areas and coverage percentages using data derived from HYDE, Yang et al. (2015), and our study with officially released NLRB data (Fig. 3). Do the scatter points include only one year or all years of NLRB data?

Response: We thank the reviewer for pointing out this. For HYDE data, we compared the cropland from the two datasets for the period of 2000 to 2016. Besides, the Global Cropland 30m were indicated using "GFSAD30m" (in the former version, both "GFSAD30m" and "GlobalCropland30m" were used). The GFSAD30m was compared with the NLRB cropland in 2015. For Yang et al (2015), the cropland area was compared with the reconstructed cropland area in 1985 from NLRB, CLRSY, and CAY data. We also added this information in the figure title for clarification. The figure has been updated to:

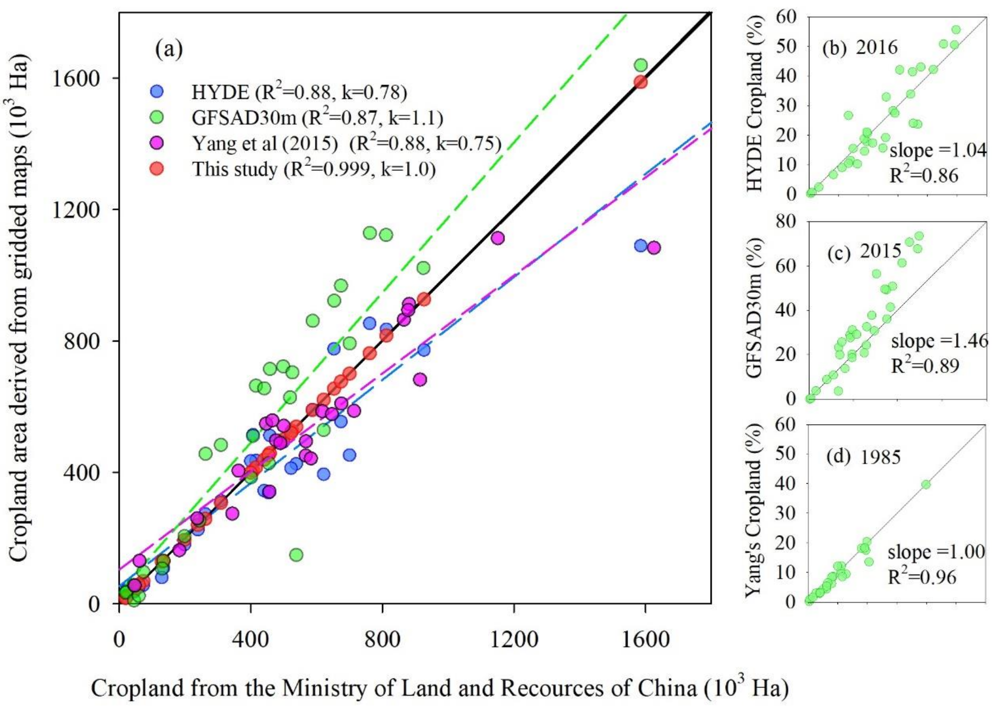

Figure 3. Comparison of cropland (a) acreage and (b) percentage in each province among different gridded maps and inventory data (HYDE data was the average cropland area from 2000 to 2016; GFSAD30m and Yang et al (2015) was compared with NLRB and reconstructed cropland area in 2015 and 1985, respectively; the black solid line is the 1:1 line and the colored dash lines are the linear regression lines).