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# Reconstruction Dataset of Cropland Change in Eastern Part of Northern China's Farming–Pastoral Zone (Liao, Jin, Yuan, and Ming Dynasities)

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**Abstract:** Reconstruction of cropland cover not only provides basic data for simulating global changes and their effects on ecological environments but it also advances understanding of regional human-environment relationships. Over the last millennium, land use in northern China's farming–pastoral zone alternated between agriculture and pastoralism, and the land use pattern showed the characteristics of half farming and half animal husbandry. Accurate reconstruction of changes in cropland cover changes in similar areas is therefore challenging. The eastern part of northern China's farming–pastoral zone was selected for this study. Historical literature and the relationship between the settlement and cropland were used to estimate cropland area during the Liao, Jin, Yuan, and Ming dynasties. Subsequently, a cropland gridded allocation method based on settlement relics was used to reconstruct a dataset of 5′×5′ cropland cover. The study produced two key outputs comprising 36 data records (occupying 2.26 MB), which were compressed into a single file (242 KB). The first was a tabular dataset on cropland area and number of settlement during the four dynasties. The second comprised two spatial datasets generated with ArcGIS: (1) boundary data of the eastern part of northern China's farming–pastoral zone, archiving in .shp data format; (2) cropland cover data at a 5′×5′ spatial resolution for four time points during these dynasties, archiving in .shp data format. Together, these datasets objectively depict the fundamental transformation in land use between the Liao and Ming dynasties, which shifted from half farming and half animal husbandry to predominantly animal husbandry in the study area.

**Keywords: land use/land cover; cropland; settlement relics; Liao, Jin, Yuan, and Ming dynasties; farming-pastoral zone**

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[2] Wu, Z. L., Fang, X. Q., Ye, Y., *et al.* Cropland change dataset in eastern part of the Agro-Pastoral Ecotone in Northern China (from Liao to Jin, Yuan and Ming) [J/DB/OL]. *Digital Journal of Global Change Data Repository*, 2023. https://doi.org/10.3974/geodb.2023.08.01.V1. https://cstr.escience.org.cn/CSTR:20146.11.2023.08.01.V1.

## 1 Introduction

Research on land use and land cover change (LUCC) is cruciel for analyzing global changes and their impacts[1]. Given the cumulative effects of human land use activities on territorial systems, the impacts of human land use during historical periods on current ecology merit attention[2,3]. Reconstruction of historical LUCC not only reflects the spatio-temporal evolution of land cover but it also provides basic data for simulating global climate and environmental changes[4–6]. Following the introduction of agricultural activities, cropland emerged as a key land use type with the fastest rate of expansion and most profound impact on the original land cover Moreover, its expansion not only directly transformed the original land cover type but it also indirectly influenced environmental changes at various scales from the regional to the global by inducing changes in the physical conditions and biogeochemical cycles of land surfaces[7]. Therefore, the reconstruction of cropland constitutes the starting point for reconstructing other land use/land cover types. Moreover, the use of a long time series for reconstructing cropland cover has a high degree of reliability and helps to deepen understanding of the entire process of land cover change caused by human activities. Several historical land use/cover datasets have been developed, notably SAGE[8], HYDE[9], PJ[10], and KK 10[5], all of which include cropland cover and have been widely used in studies on global climate and environmental changes. Despite continuous improvements in the quality of these datasets introduced through regular updates, uncertainties remain, arising mostly from two factors[11–13]. The first is the low spatial resolution (national or continental scale) used for cropland areas, and the second is the exclusive use of natural factors for designing gridded methods for allocating cropland.

The reconstruction of regional cropland cover not only depicts the process of cropland cover quantitatively but it also enables the improvement of global cropland cover datasets[13]. In recent years, a substantial body of research conducted by Chinese scholars has centered on the reconstruction of cropland cover using extensive historical literature and archaeological evidence. The following three main trends have emerged from this research. First, the work process for reconstructing cropland cover has gradually been unified and standardized[14]. Second, the research period considered in the reconstruction of cropland cover has been steadily extended to cover longer historical periods[15–17]. Third, the gridded allocation method for reconstructing cropland cover has been continuously improved, and the outcomes of reconstruction have become increasingly reliable[18–20]. Despite numerous achievements, however, it is noteworthy that recent studies have mainly focused on agricultural areas for which the historical literature is relatively rich, and where favorable conditions exist for agricultural development. Conversely, studies aimed at long-term cropland reconstruction in similar areas such as the northern China's farming–pastoral zone remain limited. This is mainly due to the fragile ecological environment and poor inheritance of agricultural development in these regions, as well as the changeable land use mode, which lead to the difficulty in obtaining historical cropland data and constructing gridded allocation method.

We selected the eastern part of northern China's farming–pastoral zone, which is highly sensitive to climate change, as our study area. Modern land uses patterns in this zone is half framing and half animal husbandry. Referring to the historical literature and considering the relationship between the settlement and cropland area, we first estimated the cropland area during the Liao, Jin, Yuan, and Ming dynasties. Next, applying a cropland allocation method based on settlement density, we reconstructed cropland coverage data at a spatial resolution of 5′×5′ for the corresponding periods. We expect that our findings will provide guiding inputs for the development of research on cropland reconstruction in similar areas, such as the farming–pastoral zones using long time series.

## 2 Metadata of the Dataset

The metadata of the Cropland change dataset in eastern part of the agro-pastoral ecotone in Northern China (from Liao to Jin, Yuan and Ming)[21] are summarized in Table 1. They include the full and abbreviated name of each dataset, the authors, the year of creation of the dataset, the spatial resolution, the data format, data size, data files, data publisher, and data-sharing policy, etc.

**Table 1** Metadata summary of the Cropland change dataset in eastern part of the agro-pastoral ecotone in Northern China (from Liao to Jin, Yuan and Ming)

| Items | Description |
|---|---|
| Dataset full name | Cropland change dataset in eastern part of the agro-pastoral ecotone in Northern China (from Liao to Jin, Yuan and Ming) |
| Dataset short name | Cropland_LiaoJinYuanMing |
| Authors | Wu, Z. L., Qinghai Normal University, Academy of Plateau Science and Sustainability, wuzl@qhnu.edu.cn<br>Fang, X. Q., Beijing Normal University, xfang@bnu.edu.cn<br>Ye, Y., Beijing Normal University, yeyuleaffish@bnu.edu.cn<br>Hu, Z. Q., Qinghai Normal University, huzq@qhnu.edu.cn |
| Geographical region | The study area is located in eastern part of northern Chinas farming-pastoral zone (41°58′N–46°53′N, 116°25′E–124°38′E), covering $1.935\times10^5$ km$^2$. This area encompasses 16 cities and counties in the eastern part of Inner Mongolia Autonomous Region (e.g., Tongliao, Wengniuteqi, Keshiketengqi), 9 cities and counties in Jilin Province (e.g., Baicheng, Taonan, Tongyu), and Taimi in Heilongjiang Province. |
| Year | Liao, Jin, Yuan, and Ming dynasties |
| Temporal resolution | Dynasty (It should be pointed out that the temporal resolution of the original settlement data[21] we used in our study was only up to the dynasty. Therefore, the final dataset of this study is the cropland area and cropland cover data of 4 periods for each dynasty) |
| Spatial resolution | 5′×5′ |
| Data format | .shp, .xlsx |
| Data size | 2.26 MB (242 KB after compression) |
| Data files | Cropland area and the number of settlement relics in Liao, Jin, Yuan, and Ming dynasties (1-CroplandArea_Liao-Jin-Yaun-Ming), and data format is .xlsx<br>Boundary data of eastern part of northern China's farming–pastoral zone (2-BND_Eastern_NorthernChina's_Farming-Pastoral_Zone), and data format is .shp<br>Cropland cover data in Liao, Jin, Yuan, and Ming dynasties (3-CroplandCover_Liao-Jin-Yuan-Ming), and the data format is .shp |
| Foundation | Ministry of Science and Technology of P. R. China (2021YFD1500704) |
| Data computing environment | ArcGIS |
| Data publisher | Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn |
| Address | No. 11A, Datun Road, Chaoyang District, Beijing 100101, China |
| Data sharing policy | ***Data*** from the Global Change Research Data Publishing & Repository includes metadata, datasets (in the *Digital Journal of Global Change Data Repository*), and publications (in the *Journal of Global Change Data & Discovery*). ***Data*** sharing policy includes: (1) ***Data*** are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use ***Data*** subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute ***Data*** subject to written permission from the GCdataPR Editorial Office and the issuance of a ***Data*** redistribution license; and (4) If ***Data*** are used to compile new datasets, the 'ten per cent principal' should be followed such that ***Data*** records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset[22] |
| Communication and searchable system | DOI，CSTR，Crossref，DCI，CSCD，CNKI，SciEngine，WDS/ISC，GEOSS |

# 3 Methods

## 3.1 Selection and Delimitation of the Eastern Part of Northern China' Farming–Pastoral Zone

Given significant changes in the farming–pastoral zone during historical periods, and the coincidence of its range with the natural boundary (Figure 1a), depicting a clear and bounded sub-national administrative unit (provincial administrative unit) posed challenges[23-25]. Therefore, considering issues of feasibility and the data availability, we selected farming areas in southeastern Shangjing Dao during the Liao dynasty for our case study. This period coincided with the Medieval Warm Period, which was characterized by a relatively warm and humid climate a thousand years ago[25,26]. This area has the largest bandwidth within the farming–pastoral zone in northern China (Figure 1a).

The territory of the Liao dynasty ( 907–1125 AD), which was established by the nomadic Khitan, broadly encompassed northern China (currently the provinces of Jilin, Heilongjiang, Liaoning, Hebei, and Shanxi and the entire Inner Mongolia Autonomous Region), as well as parts of contemporary Russia and Mongolia. However, its economic and political center was concentrated in northeastern China (Figure 1b). The administrative region of the Liao dynasty encompassed five daos, namely Shangjing Dao, Dongjing Dao, Nanjing Dao, Xijing Dao, and Zhongjing Dao (Figure 1b). Of these daos, Shangjing Dao, located in Linhuang Fu (the capital city during the Liao dynasty), was also important as the area where agriculture was initiated and developed during the Liao dynasty. In particular, the area along the Xar Moron River in southeastern Shangjing Dao bacame a hub of agricultural development as a result of population agglomeration (Figure 1c)[27–31].

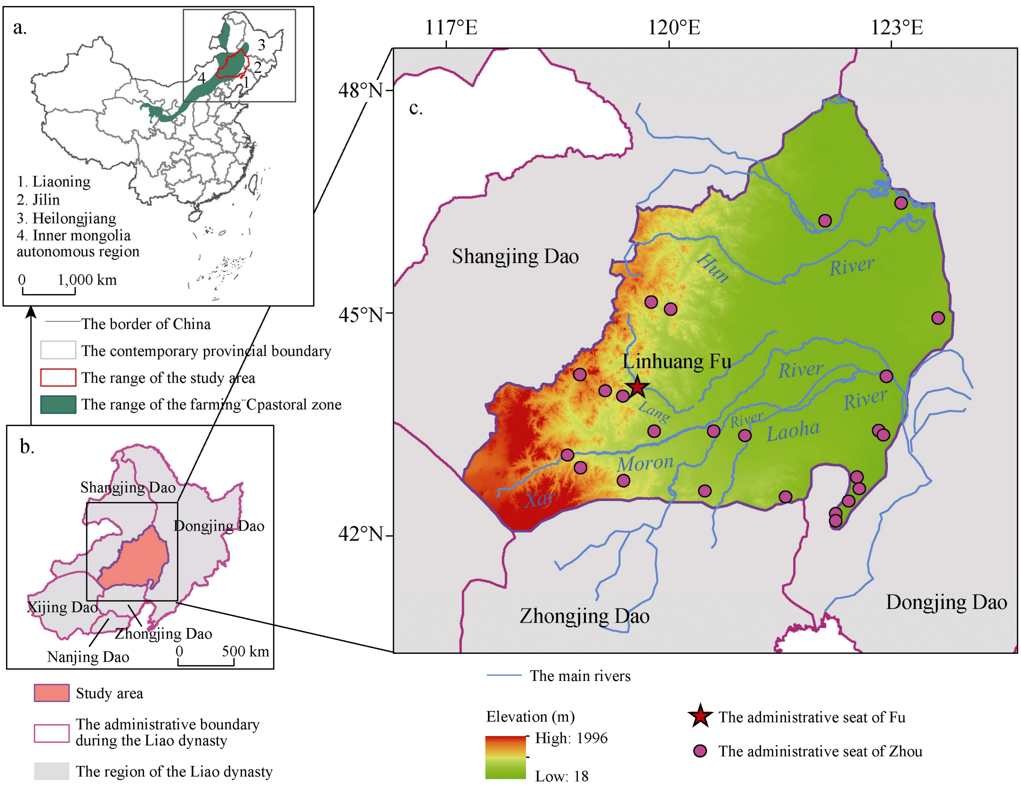


**Figure 1** Maps of the eastern part of northern China's farming–pastoral zone[30]: (a) The range of northern China's farming–pastoral zone; (b) Administrative boundaries during the Liao dynasty[31]; (c) The distribution of the administrative centers of Fu and Zhou

Because of constraints posed by the population structure and natural conditions, farming areas were concentrated in southeastern Shangjing Dao. We identified and selected this area as our study area according to the spatial distribution of settlement relics from the Liao dynasty and contemporary administrative maps of Chinese counties.

### 3.2 Data Sources on Historical Settlements and Their Analysis

Data on settlements during the Liao dynasty used in this study were sourced from Wu *et al.*[18], which draws on the sixth volume of The Historical Atlas of China[31]. Data on settlement during the Jin, Yuan, and Ming dynasties were extracted from Jia *et al.*[23].

### 3.3 Method Used to Estimate Cropland Areas

(1) Estimation method used for the cropland area during the Liao dynasty

Taking a balance between regional production and consumption as the premise, we estimated the cropland area during the Liao dynasty by performing the following steps. First, we estimated grain consumption per person. Second, we estimated the cropland area per person and per year, and the corresponding cropland area per household through a comprehensive consideration of human factors. These factors included grain yield per unit area, farming systems, and dietary differences among the various agricultural and non-agricultural ethnic groups. Last, we estimated the total cropland area in the study region, considering the number of households.

$$T_{Crop_{area}} = F_{Crop_{area}} + P_{Crop_{area}} \tag{1}$$

where, $T_{Crop_{area}}$ denotes the total cropland area in the study area, $F_{Crop_{area}}$ denotes the annual cropland area demand of the agricultural households, and $P_{Crop_{area}}$ denotes the annual cropland area demand of non-agricultural households.

$$F_{\text{Crop}_{\text{area}}} = F_{\text{population}} \times A_{\text{Crop}_{\text{area}}} \tag{2}$$

$$P_{\text{crop}_{\text{area}}} = P_{\text{population}} \times A_{\text{crop}_{\text{area}}} \times 1/10 \tag{3}$$

where, $F_{population}$ denotes the total number of agricultural households, $P_{\text{population}}$ denotes the total number of non-agricultural households, and $A_{\text{Crop}_{\text{area}}}$ denotes the cropland area per household.

During the Liao dynasty, there are about 6.5 person per household (four adults, including two soldiers, and 2.5 minors)[32, 33]. In study area, the per capita cropland area for every adult and minor (12 Song mu and 6 Song mu, respectively). Thus, the cropland area per household was estimated at 63 Song mu[34]. Then, it was estimated that the cropland area required by a non-agricultural household was one-tenth of the cropland area required by an agricultural household[34, 35]. At a final step, we converted the unit of cropland area from ha to km$^2$, with 1 ha=0.01 km$^2$.

(2) Estimation method used for cropland area during the Jin, Yuan, and Ming dynasties

During Liao, Jin, Yuan, and Ming dynasties, the agricultural production technology in the study area was in the traditional agricultural stage and the agricultural production level was similar[28]. Hence, it can be assumed that the agricultural production levels during the Liao, Jin, Yuan, and Ming dynasties were relatively stable in the study area. Accordingly, we used the cropland area per settlement during the Liao dynasty and the number of settlements during the Jin, Yuan, and Ming dynasties to estimate the cropland area during each respective historical period.

Calculation of cropland area per settlement during the Liao dynasty was as follows. During a particular historical period, cropland was generally distributed around settlements. Therefore, the total cropland area within a region would comprise the sum of cropland area around each settlement. Moreover, the locations of settlements could indicate those of cropland, and the number of settlement could also reflect how much cropland had been cultivated within the area.

The calculation was performed using the following Equations:

$$CA(w,t) = a_1 + a_2 + a_3 + \cdots a_N \tag{4}$$

$$\bar{a}(w,t) = \frac{(a_1 + a_2 + a_3 + \cdots a_N)}{SN(w,t)} \tag{5}$$

where, $CA(w,t)$ denotes the total cropland area in year *t* and region *w*, and $a_N$ denotes the cropland area of the Nth settlement in year *t* and region *w*. *N* is the serial number of the settlement. In Equation (5), $\bar{a}(w,t)$ denotes the average cropland area per settlement in year *t* and region *w*, and $SN(w,t)$ denotes the number of settlements in year *t* and region *w*. Thus, the average cropland area per settlement can be calculated by basing on the total cropland area and the number of settlement during the Liao dynasty.

The estimation of cropland area during the Jin, Yuan, and Ming dynasties was performed as follows. Equation (6) was derived from Equations (4) and (5), that is, the total cropland area ( $CA(w,t)$ ) in a region was deemed equal to the product of the average cropland area per settlement ( $\bar{a}(w,t)$ ) and the number of settlements ( $SN(w,t)$ ).

$$CA(w,t) = \bar{a}(w,t) \times SN(w,t) \tag{6}$$

Thus, we used the average cropland area per settlement during the Liao dynasty's and settlement data during the Jin, Yuan, and Ming dynasties to estimate the cropland area during these respective periods.

### 3.4 Settlement Density-based Cropland Allocation Method

We utilized a settlement density-based cropland allocation method to reconstruct cropland cover[18, 19]. The specific steps implemented were as follows.

(1) Combined with spatial resolution of international dataset and the actual situation in our study area, we selected grid scale with 5′×5′ spatial resolution to reconstruct cropland cover. Next, we constructed the grids with 5′×5′ spatial resolution for the study area, and counted the number of settlements in each grid.

(2) Identification of cropland grid. If a grid contained settlements, it was identified as a cropland grid, otherwise, it was identified as a non-cropland grid.

(3) Construction of the weight for cropland gridded allocation. The number of settlements included in the grid determined the amount of cropland allocated to each grid.

(4) Utilized settlement density-based weight for the cropland gridded allocation to allocate the cropland area in grid scale during the Liao, Jin, Yuan, and Ming dynasties. The outcome was the fraction of cropland in the grid.

The following Equations were used for the calculation:

$$CA(i,t) = CA(w,t) \times Z(i,t) \tag{7}$$

$$CA(w,t) = \sum_{i=1}^{n} CA(i,t) \tag{8}$$

$$Z(i,t) = \frac{CA(i,t)}{\sum_{i=1}^{n} CA(i,t)} \tag{9}$$

where, $Z(i,t)$ values ranging from 0 to 1 denotes the weight for allocating the cropland area in year *t* and in grid *i*.

The weight of cropland allocation, which was based on the number of settlements, was derived from Equations (6) and (9), simplified into Equation (10) as follows:

$$Z(i,t)=\frac{SN(i,t)}{\sum_{i=1}^{n}SN(i,t)} \tag{10}$$

$$SD(i,t)=\frac{SN(i,t)}{area(i)} \tag{11}$$

where,, $SD(i,t)$ denotes the settlement density in grid *i* and year *t*, $SD(i,t)$ denotes the number of settlements in grid *i* and year *t*, and $area(i)$ denotes the area of the grid. The settlement density-based weight was derived from Equations (10) and (11), which were simplified into Equation (12) as follows:

$$Z(i,t)=\frac{SD(i,t)}{\sum_{i=1}^{n}SD(i,t)} \tag{12}$$

The Equation used for calculating the cropland area in the grid was based on settlement density, as shown below:

$$CA(i,t)=CA(w,t)\times\frac{SD(i,t)}{\sum_{i=1}^{n}SD(i,t)} \tag{13}$$

Equation (14) was used to calculate the fraction of cropland in the grid:

$$FR(i,t)=\frac{CA(i,t)}{area(i)} \tag{14}$$

where, $FR(i,t)$ denotes the cropland fraction in grid *i* and year *t*, $CA(i,t)$ denotes the cropland area being allocated in grid *i* and year *t*, and $area(i)$ denotes the area of the grid. Notably, an assumption in this study was that the grid area varied with latitude.

## 4 Data Results and Validation

### 4.1 Data Composition

The reconstructed dataset of cropland change in eastern part of northern China's farming-pastoral zone (Liao, Jin, Yuan, and Ming dynasties) contains the boundary data of the eastern part of northern China's farming-pastoral zone (.shp data format), cropland area (.xlsx data format), and the number of settlements during each of the above dynasties (.xlsx data format). They also include cropland cover data (.shp data format), with 5′×5′ and dynasty as the spatial resolution and temporal resolutions, respectively.

### 4.2 Data Results and Validation

(1) Estimation of the total cropland area during the Jin, Yuan, and Ming dynasties

Considering reconstructed cropland area during the Liao dynasty (3,905 km$^2$) and the number of settlement relics (1,834), we calculated that the cropland area per settlement during the Liao dynasty was 2.13 km$^2$. Given that agricultural productivity levels were similar during the Liao, Jin, Yuan, and Ming dynasties, we used the cropland area per settlement during the Liao dynasty (2.13 km$^2$) and the number of settlement during the Jin (825), Yuan (72), and Ming (29) dynasties to estimate the cropland area, which were 1,757 km$^2$ (Jin dynasty), 154 km$^2$ (Yuan dynasty), and 62 km$^2$ (Ming dynasty). The cropland fractions in the study area were 2.0%, 0.9%, 0.1%, 0.03%, during the Liao, Jin, Yuan, Ming dynasties. Between the Liao and Ming dynasties, the number of settlement and cropland area decreased sharply 98.4% and 98.0%, respectively, indicating that the type of land use in the study area shifted from half farming and half animal husbandry to animal husbandry (Figure 2).

To evaluate the accuracy of the estimates of reconstructed cropland area obtained in this study, and taking cropland area during the Liao dynasty as an example, we compared our results with those of other studies. This analysis revealed that reconstructed cropland area of this study was similar to that obtained by Li *et al.* [34]. It was also similar to the cropland area estimated by Han[29] ($5.0\times10^4$ ha$\approx$$0.34\times10^4$ km$^2$) in the Xar Moron River Valley and its neighborhood. The figure for the reconstructed cropland area obtained in this study was slightly larger, mainly because its coverage was greater. Therefore, the reliability of the reconstructed cropland area estimated in this study was confirmed[18].

(2) Gridded allocation results of cropland cover

Figure 3 shows the gridded allocation results of cropland cover with 5′ resolution during the Liao, Jin, Yuan, and Ming dynasties.The spatial distribution of cropland cover revealed that the widest distribution of this land use type occurred during the Liao dynasty. Subsequently, there was some reduction in its distribution during the Jin dynasty and a significant reduction during the Yuan dynasty, with only scattered areas of cropland remaining in the study area during the Ming dynasty.

During the Liao dynasty, the spatial distribution of cropland was constrained by the fragile natural environment, revealing a mosaic pattern[29, 35]. The cropland grids comprised 28.3% of the total grids in the study area and occurred alongside major rivers, such as the Xar Moron, Lang and Laha Rivers[28, 29] (Figure 3a). The average cropland fraction of the cropland grids was 6.6% and the largest fraction was 31.4%. Differences in the spatial distribution of cropland fractions were significant. The distribution of higher cropland fractions corresponded to centrally located settlements, such as Linhuang Fu, Hengzhou and Fengzhou, with these fractions gradually decreasing with increasing distance from the centers with high cropland fractions.

During the Jin dynasty, the cropland grids comprised 13.4% of the total grids in study area, which decreased by 14.9 percentage points compared with Liao dynasty, indicating that the scale of the cropland has been reduced. The average cropland fraction of the cropland grids was 6.3% and the highest fraction was 30.3% (Figure 3b). The cropland was mainly distributed in the eastern part of the study area, largely because of the spatial shift in the agricultural center of gravity caused by population migration. Starting in the middle period of the Jin dynasty, a large proportion of the agricultural population moved eastward from areas located near the Laha River to Xingzhongfu along the Daling River, resulting in a shift in the agricultural center of gravity.

During the Yuan dynasty, the cropland grids comprised just 1.8% of the total grids in the study area, indicating a decrease by 11.6 percentage points compared with their proportion during the Jin dynasty. The spatial scale of cropland was further reduced, and cropland remained concentrated exclusively in the southern part of the study area (Figure 3c). The average cropland fraction in the grids was 4.1% and the highest fraction was 10.1%. The Mongolians, who ruled during the Yuan dynasty, practiced animal husbandry for their subsistence and lacked farming traditions or interest in agricultural development. Consequently, agriculture was mostly replaced by nomadic animal husbandry in the study area.

During the Ming dynasty, cropland grids comprised just 0.8% of the total grids in the study area, and cropland was scattered. Of the four dynasties during the study period, the Ming dynasty was associated with the least distribution and cropland area (Figure 3d). The average cropland fraction in the grids was 3.8%, and the highest fraction was 7.1%. The rulers of the Ming dynasty had a longstanding conflict with nomadic tribes in the Mongolian plateau, such as the Tartars, and never fully controlled this region. On the one hand, the study area was outside the border walls built by Ming dynasty, and on the other hand, the Mongolian plateau did not form a stable regime for a long time. Therefore, during the Ming dynasty, a stable political environment was lacking in this region, leading to the decline of agriculture and the ascent of pastoralism.

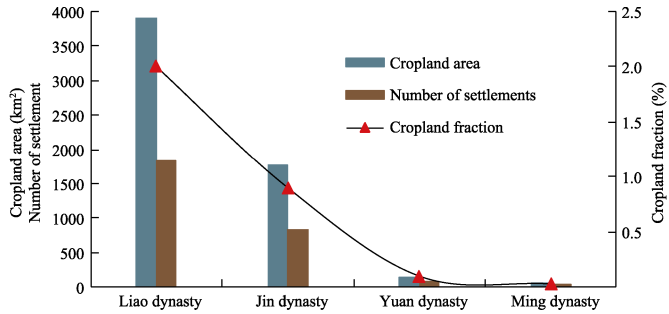


**Figure 2** Trends in the total cropland area and the number of settlements during in the Liao, Jin, Yuan, and Ming dynasties in the eastern part of northern China's framing–pastoral zone

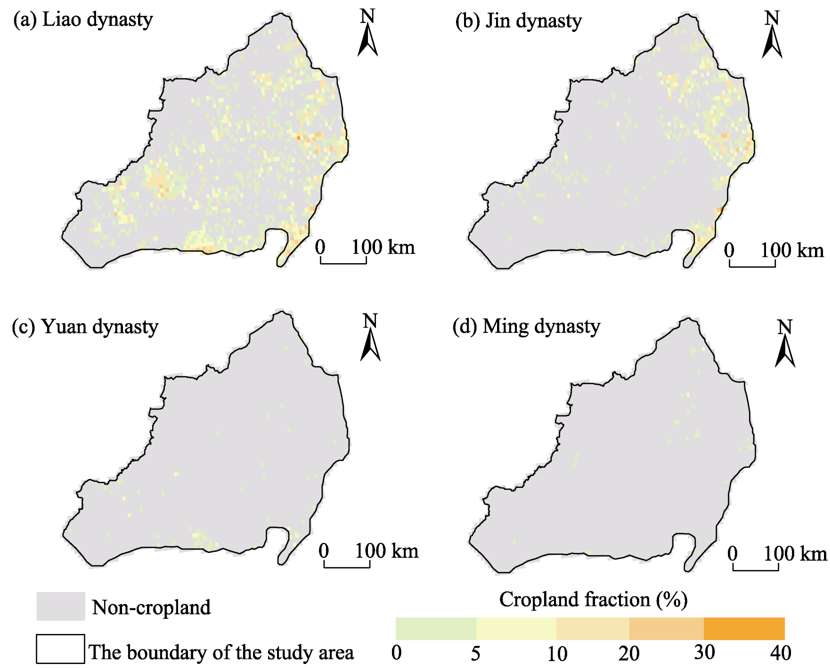


**Figure 3** Maps of the reconstruction of cropland cover during the Liao, Jin, Yuan, and Ming dynasties in the eastern part of northern China's framing–pastoral zone

To evaluate the reliability of our results for the gridded allocation of cropland, we compared them with gridded cropland cover data for the same time section in the HYDE 3.2 global land cover datasets. The analysis revealed that cropland cover reconstructed using the settlement density method in this study was effective in overcoming the defects of recons truction based on the land suitability for cultivation. Moreover, it illuminated the change in land use from farming to animal husbandry in the study area. Therefore, this method accurately and objectively reproduced the change in cropland cover. In sum, the cropland cover data reconstructed in this study was deemed reliable[30].

## 5 Discussion and Conclusion

This dataset based on historical literature and settlement relics reconstructed the cropland area and cropland cover with 5′ resolution in eastern part of northern China's farming-pastoral zone in Liao, Jin, Yuan and Ming dynasty. Between the Liao and Ming dynasties, the total cropland area in the study area decreased by 98.0% from 3,905 $km^2$ to 62 $km^2$. The spatial distribution and coverage of cropland was found to be greatest during the Liao dynasty and was subsequently reduced during the Jin dynasty. However, a drastic reduction of cropland occurred during the Yuan dynasty, and during the Ming dynasty, only scattered patches of cropland remained. Hence, our findings indicated that over the past millennium, land use in the study area underwent a fundamental change from agriculture to pastoralism caused by climate change and human factors. To sum up, our dataset not only provides an accurate quantitative depiction of the process of change of cropland cover but it also provides valuable inputs for reconstructing changes in cropland cover in similar areas with fragile ecological environments, which are vulnerable to climate change.

### *Author Contributions*

Fang, X. Q and Wu, Z. L. designed the study. Ye, Y., Wu, Z. L. and Hu, Z. Q. contributed to the processing and analysis of the cropland data. Fang, X. Q. and Wu, Z. L. designed the algorithms of the dataset. Wu, Z. L. wrote the data paper.

### *Conflicts of Interest*

The authors declare no conflicts of interest.

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